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Older People and Their Potentialities for Gainful Employment

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CONSIDERING THE INCREASING PROPORTION OF ELDERLY INDIVIDUALS IN OUR POPULATION, THE PROBLEM OF THEIR ROLE IN OUR SOCIETY AND THE MOST ECONOMICAL METHODS FOR THEIR CARE ARISES. DR. SHOCK DISCUSSES THE SLOWING DOWN OF PHYSIOLOGIC PROCESSES IN THE AGED, THE ARGUMENTS FOR AND AGAINST THE EMPLOYMENT OF OLDER PEOPLE, AND SUGGESTS A PROGRAM TO UTILIZE ADEQUATELY THE POTENTIALITIES OF OLDER WORKERS FOR GAINFUL EMPLOYMENT.

THERE is no escape from the fact that we are becoming a nation of elders. By 1980 it is estmated that 50 per cent of the population will be over 45, and 15 per cent will be 65 years of age or older. War casualties will obviously accentuate this trend, which is already reflected in the average age of employees in business and manufacturing. In fact, one large concern has found that the average age of its employees is increasing in the unexpected amount of almost a year annually (27).

Three factors are contributing to the shift in the age composition of our population. First, more lives are saved from premature death; larger numbers survive to advanced old age. This progressive increase of the average length of life during the past half of a century is shown in figure 1 (6). During this time the average life expectancy at birth has increased from 51 years in 1919 to 65 years in 1945. The second factor of primary importance in the changing age composition of the population is the rapidly declining birth rate. In 1915 the birth rate in the United States was approximately 25 per thousand, and in 1933 the birth rate had declined to a low of 16 per thousand. Although the war years have shown an increase in the birth rate, it is most probable that this is a temporary rise;

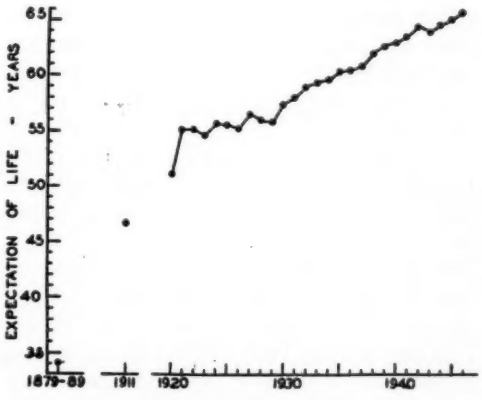

FIG. 1. Average expectation of life at birth from 1879 to 1945. Industrial Dept., Metropolitan Life Insurance Co. The figures for the years 1942 to 1945 exclude military and civilian deaths from enemy action; they include all other deaths, and, in addition, make an allowance for deaths that would normally have occurred among those killed in action. (*Stat. Bull. Metropolitan Life Insurance Co., 27:* 1–3, Aug. 1946.) Tentative data for 1946 supplied through courtesy of Dr. L. I. Dublin.

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and it is believed that the birth rate will again decline within the next few years. A third factor, immigration, which at one time was of great importance in contributing individuals of lower ages to our population, seems destined to play a minor role in the future.

As a result, the proportion of young individuals in the population is declining while that of older persons is increasing. These facts are shown graphically in figure 2 (5). The percentage of individuals 45 years of age or older has increased from 12.4 per cent in 1850 to 17.8 per cent in 1900 and to 26.5 per cent in 1940. With this increasing proportion of elderly individuals in the population, it is necessary to give some consideration to the problem of their role in our society and the most economical methods for their care.

Of first importance is the maintenance of health and vigor as long as possible, since illness with the necessity of hospitalization greatly increases the cost of care. It is obvious that, if these older people are not to become an economic burden, they must not only be kept out of hospitals, but also they must be permitted to contribute to the total economy of the country within the limits of their capabilities. In order to plan for their contribution to the economy of the country, it is essential to know not only the health status, but also the potential performance capacity of individuals in this older age group. We do not as yet have enough studies of older people to make definite answers to these questions possible. Nevertheless, we can indicate the general trend and some of the physiologic limits which must be considered in planning for the gainful employment of older people.

First of all it must be recognized that age changes begin early in life. Although aging ultimately produces structural changes in body organs and tissues, impairment of function and reduction in the reserve capacity for performance usually occur long before structural alterations can be detected. In fact, the first measurable indication of aging is the slowing down of fundamental physiologic processes.

This slowing down process may be illustrated by comparing the speed with which extra sugar is removed from the blood stream in young and old individuals after oral ingestion. Figure 3 shows that in the young adult (curve A) the mechanisms which regulate blood sugar levels are more effective than in older subjects, i.e., the extent of displacement is less, and normal values are attained more quickly after the ingestion of sugar in young adults than in aged subjects (24).

The same slowing down of other physiologic processes in the aged is illustrated in figure 4, which shows the rate of removal of bicarbonate from the blood stream following its oral ingestion. This figure shows greater and more rapid absorption of bicarbonate as well as more rapid return to normal blood levels in the young than in the aged subject. It should be noted that the aged subject was ultimately able to bring the bicarbonate level of his blood back to normal just as was the young adult,

THE PROPORTION OF VARIOUS AGE GROUPS AMONG THE POPULATION OF THE UNITED STATES FROM 1850 TO 1980

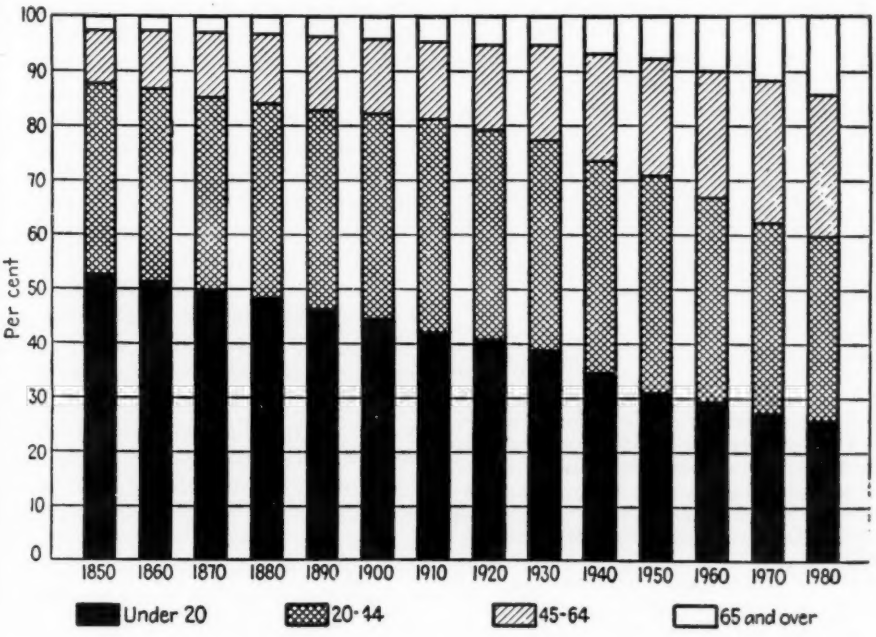


FIG. 2. Per cent distribution of total population by ages, United States, 1850 to 1980. (Adapted from Chap. 6, Longevity in Retrospect and in Prospect by Louis I. Dublin in *Problems of Ageing*, edited by E. V. Cowdry, Williams and Wilkins, 1942.)

but a much greater time was required to complete the adjustment (24).

Many other organ systems in the body show a reduced capacity for function with increasing age. Such functional changes may occur in the absence of known disease or pathologic condition. For instance, the excretory capacity of the kidney may be diminished in older individuals even though no clinical signs or symptoms of kidney disease are present. It has been shown that the capacity of the kidney tubules to excrete diodrast was reduced to half of that observed in young adults (25). This impairment in tubular function is probably accompanied by delayed excretion of any unusual accumulation of ordinary waste products from the body.

Among other examples of reduced effectiveness of physiologic adjustments in older individuals are the following: reduction in vital capacity (2), reduction in basal oxygen consumption (1), reduction in acidity of digestive fluids (21), reduction in elasticity of the arterial system (10), increase in diastolic blood pressure (23), reduction in the range of accommodation of the eye (7), as well as many others (24). Thus, it is possible to show that with increasing age there is a reduction in the reserve capacity of a great many organ systems as well as a reduction in the speed with which physiologic readjustments are made.

It has been shown experimentally that the physical capacities of older persons are diminished. The maximum amount of physical work is reduced, and the time required for recovery may be greatly lengthened. Figure 5 shows that older individuals are unable to make the physiologic adjustments required for maximum exercise and also that recovery as measured by pulse

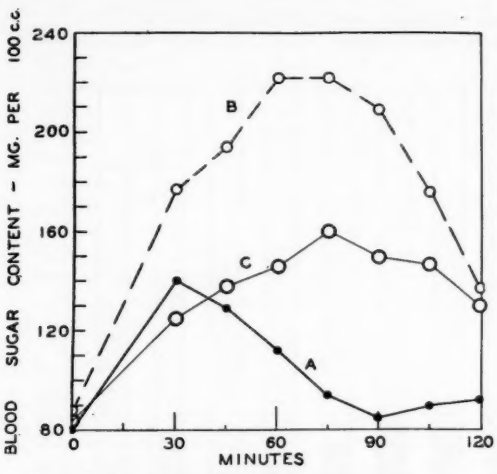


FIG. 3. Age changes in glucose tolerance curves. Curve A—Blood sugar levels after ingestion of 50 gm. glucose by 40 year old male. Curve B—Blood sugar levels after ingestion of 50 gm. glucose by 83 year old normal healthy male. Curve rises slowly to higher levels than in young adult, indicating impairment of removal or storage mechanism. Curve C—Blood sugar levels after ingestion of 50 gm. glucose by 80 year old healthy male. Curve shows slow rise and delayed fall. May be related to slow absorption of glucose as well as impaired storage mechanisms. Only about 10 per cent of aged subjects show curves like A; 60 to 70 per cent show curves like B or C. (N. W. Shock, Physiological Aspects of Mental Disorders in Later Life, *Mental Disorders in Later Life*, edited by Oscar J. Kaplan, Stanford University Press, 1945.)

rate is slower (22). Measurements of oxygen consumption after maximal exercise show that whereas a young adolescent can recover completely by the end of thirty minutes, young adults require three to four hours for recovery from a comparable amount of exertion (26). Such findings lead to the conclusion that frequent rest periods are more necessary to older workers than to younger ones.

The most obvious mental defect in advanced years is the failure of memory for recent events. This fact has been experimentally verified by Gilbert (9) in a study comparing the capacity for immediate memory in 174 older subjects with that of an equal number of men in their twenties. The two groups were of equal intelligence judged by mental tests. The results showed that the older persons were slower in their ability to form new associations based upon entirely new material. McFarland has shown that when young individuals were subjected to experimental conditions in which the oxygen content of the air was lowered, as at higher altitudes, their learning ability was diminished a great deal more than was that of older persons subjected to the same conditions. It is suggested that the older man's decline in memory may be attributable to changes in circulation of the blood and metabolism of the brain (15, 16).

Types of performance which are more complex and free from factors involving physical speed and effort show little decline with age. Intelligence tests which do not depend upon speed show no decline with age (29). The long list of men who have made significant contributions to literature, philosophy, science, and medicine in the later years of their life offers evidence that mental deterioration is not a necessary result of aging (13, 14).

With increasing age, certain limitations in performance have been observed. Par-

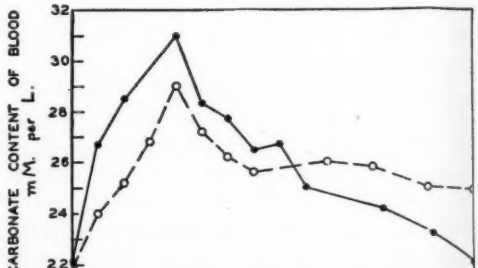


FIG. 4. Age changes in rate of elimination of excess alkali from blood. ○——○——○ Bicarbonate content of blood serum (corrected to pH =7.4) after ingestion of 25 gm. of sodium bicarbonate by a 30 year old male. ○---○---○ Bicarbonate content of blood serum (corrected to pH =7.4) after ingestion of 25 gm. of sodium bicarbonate by a 72 year old normal male. (N. W. Shock, Physiological Aspects of Mental Disorders in Later Life, *Mental Disorders in Later Life*, edited by Oscar J. Kaplan, Stanford University Press, 1945.)

ticularly apparent are perception and motor skills in which speed is an important factor. The incidence of sensory impairments in hearing and vision increases with age. However, many of these defects may now be corrected by hearing aids and the proper fitting of glasses so that these defects assume minor importance in employment. Speed of reaction diminishes in older people. Other motor tests, in which speed is an important factor, show a reduction in capacities (17, 18, 19). Nevertheless, it is important to observe that individual differences are very great in these tests and that a large proportion of older persons equal or even exceed the average performance of other individuals who are several decades younger. There is no scientific evidence for the popular dictum, "You can't teach an old dog new tricks." It has been shown that with adequate motivation the average ability to learn as measured in experimental situations diminishes only slightly at higher age levels (29). Certainly the ability to learn is not significantly reduced in middle age or even later. Older workers age 35 to 50, sent to the War Production Retraining Course at the Harvard University Graduate School of Business Administration, were successfully trained for more responsible positions in the war effort. Their professors were convinced that these older workers could retain and master new information with adequate incentives. In addition, because of their past experience in industry, they were able to contribute new ideas and procedures which were definitely original and valuable. It was concluded that improvements might be made in the timing of educational procedures in older workers (16). It is important that the older worker be equipped for tasks which make fewer demands upon physical abilities during advanced age and that the tasks be of such a nature that speed is not an important factor.

Although the incidence of invalidism in the population increases with age, it must be recognized that the diseases which are most important in producing disabilities are not the ones for which mortality is highest in the higher age groups. This difference between disability and mortality is best illustrated by figures 6 and 7. These charts show that whereas heart disease, cancer, arteriosclerosis, nephritis, tuberculosis, and diabetes are important causes

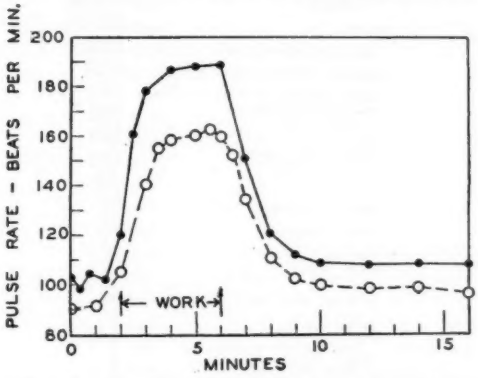
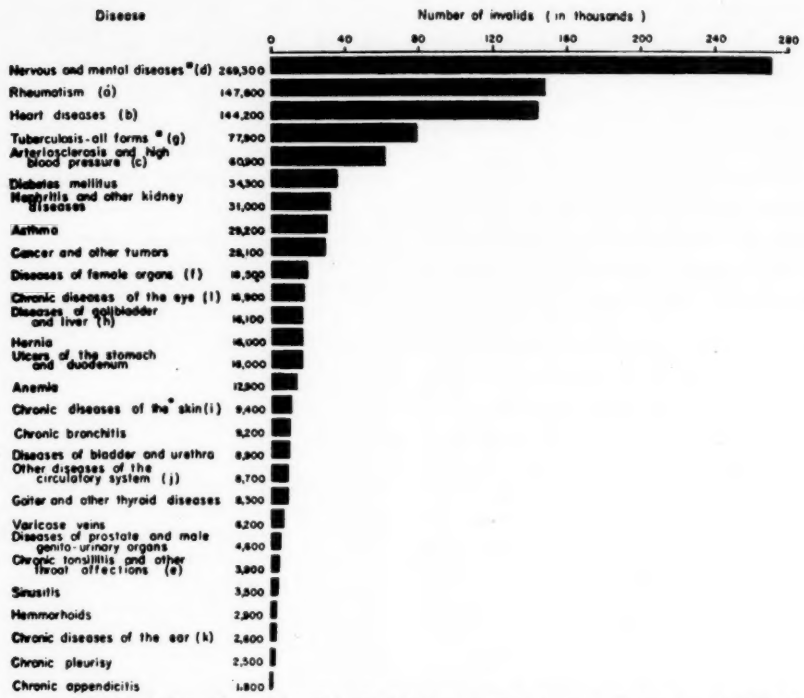


FIG. 5. Age change in pulse rate response to severe exercise. ○——○——○ Pulse rate response to exercise in young adult males (ages 20 to 29 years). ○ - - - ○ - - - ○ Pulse rate responses to exercise in aged males (ages 59 to 78 years). Note the more rapid rate of increase and decrease of pulse rate of young subjects than of old. Data from Robinson (22). (N. W. Shock, Physiological Aspects of Mental Disorders in Later Life, *Mental Disorders in Later Life*, edited by Oscar J. Kaplan, Stanford University Press, 1945.)

of death, the most important causes of invalidism are nervous and mental diseases, rheumatism, heart disease, tuberculosis, diabetes, and nephritis (20). Examination of the percentage distribution of persons with chronic disease or permanent impairment according to age groups shows that chronic disease is most prevalent in the two decades from 35 to 54, while disablement and invalidism are at their peak from 50 to 74 (20). Obviously a large proportion of the disablement in the senescent age group arises from disorders present twenty years earlier. Thus, one of the most important problems for geriatric research is the development of methods for discovering early signs of disability. Furthermore, it will be necessary to develop tests to determine just how much impairment in


Disease
Number of invalids (in thousands)
0
40
80
120
160
200
240
280
Nervous and mental diseases (d) 269,300
Rheumatism (a) 147,600
Heart diseases (b) 144,200
Tuberculosis - all forms (g) 77,900
Arteriosclerosis and high blood pressure (c) 60,900
Diabetes mellitus 34,300
Nephritis and other kidney diseases 31,000
Asthma 29,200
Cancer and other tumors 28,100
Diseases of female organs (f) 18,300
Chronic diseases of the eye (l) 16,900
Diseases of gallbladder and liver (h) 16,100
Hernia 16,000
Ulcers of the stomach and duodenum 16,000
Anemia 12,500
Chronic diseases of the skin (i) 9,400
Chronic bronchitis 9,200
Diseases of bladder and urethra 8,900
Other diseases of the circulatory system (j) 8,700
Goiter and other thyroid diseases 8,300
Varicose veins 6,200
Diseases of prostate and male genito-urinary organs 4,600
Chronic tonsillitis and other throat affections (e) 3,800
Sinusitis 3,500
Hemmorhoids 2,900
Chronic diseases of the ear (k) 2,600
Chronic pleurisy 2,300
Chronic appendicitis 1,800

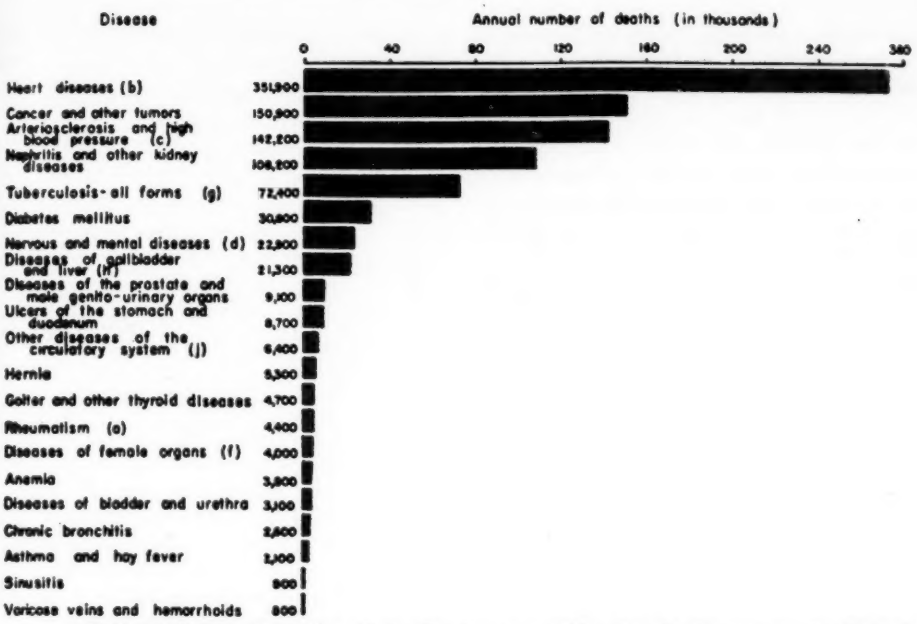
—Estimated number of invalids disabled by certain chronic diseases in the United States, 1937. (U. S. P. H. S.)

FIG. 6. Estimated number of invalids disabled by certain chronic diseases in the United States, 1937 (20).

function and performance is present in individuals suffering from various kinds and degrees of chronic disease.

The arguments against the employment of older workers may be classified in the following categories: (1) reduced productivity, (2) increased labor turnover, (3) increased accident rate, and (4) increased sickness or absenteeism. Since there are few occupations in which a substantial number of workers are employed on work of equal difficulty, the speed of which is governed by the worker himself and for which individual production records are available, it is almost impossible to determine the role of age in industrial output. However, on the basis of our physiologic knowledge, it seems probable that work output may diminish in older workers. Hence, it is important that an educational program be instituted which will make it possible to place the older worker in positions where speed is of lesser importance (28). Obviously one would not expect older workers to maintain the same working pace on assembly lines as younger workers. With the increasing number of older workers in the population, it would seem to be more economical to keep these persons employed in lesser positions rather than to totally exclude them from the wage-earning population.

With respect to labor turnover, the older worker is a distinct asset. Kitson (11) has demonstrated a steady and rapid increase in length of employment of workers between the ages of 21 and 31. This is followed by a plateau and a further lengthening of service of workers beyond the age of 50. Davidson and Anderson (4) found that there was little shifting to new occupations after the age of 35. Since the training of new employees in industry is frequently


Disease
Annual number of deaths (in thousands)
0
40
80
120
160
200
240
280
Heart diseases (b) 351,900
Cancer and other tumors 150,900
Arteriosclerosis and high blood pressure (c) 142,200
Nephritis and other kidney diseases 108,200
Tuberculosis - all forms (g) 72,400
Diabetes mellitus 30,800
Nervous and mental diseases (d) 22,900
Diseases of gallbladder and liver (h) 21,300
Diseases of the prostate and male genito-urinary organs 9,100
Ulcers of the stomach and duodenum 8,700
Other diseases of the circulatory system (j) 6,400
Hernia 5,300
Goiter and other thyroid diseases 4,700
Rheumatism (a) 4,400
Diseases of female organs (f) 4,000
Anemia 3,800
Diseases of bladder and urethra 3,100
Chronic bronchitis 2,600
Asthma and hay fever 2,100
Sinusitis 900
Varicose veins and hemorrhoids 800

—Estimated annual number of deaths due to specific chronic diseases in the United States, 1937. (U. S. P. H. S.)

Fig. 7. Estimated annual number of deaths due to specific chronic diseases in the United States, 1937 (20).

very expensive, this increase in the stability of older workers is of great practical importance.

The belief that the older worker is more of an accident risk than the younger worker is not justified by facts. Kossoris (12) has shown that in 26,000 employees in four plants, the accident rate was highest for the younger workers in terms of frequency rates. That is, the average number of disabling injuries per million workers was higher among young workers than among old. Men between the ages of 40 and 54 had rates only about two-thirds as high as workers under 21, and 70 per cent as high as those in their twenties. The rate for workers aged 60 and over was lower than for those under 21 and about the same as for those between 21 and 29 years of age. Vernon (30) has reviewed a number of studies by the British Industrial Health Research Board and found a demonstrable decline of accidents with age.

There are some exceptions to the general rule that older workers are less prone to accidents. One of these is connected with working in high environmental temperatures. In a study of the incidence of accidents among coal miners reported by Vernon and Bedford (31), it was found that the higher the temperature, the greater was the rise in accidents among older workers as compared with younger ones. Although usually older workers tend to be involved in fewer accidents, the duration of each disability tends to increase. Their injuries are apt to be more severe, and the healing process is slower. For instance, in a study in four companies by Brundage (3), the average healing period for workers between 40 and 44 years of age was thirty days as against twenty-three days for workers between the ages of 21 and 24. For ages 55 and over the healing period averaged thirty-four days. The diminished accident rate for older workers more than counterbalances this

longer healing period so that, in general, it may be concluded that older men have proved less expensive from the standpoint of accident cost than younger men.

In the general population it is undoubtedly true that there is more illness among older people than among younger ones. Older workers generally tend to be absent from work because of illness for a longer number of days than young workers. The frequency of illness, however, may decrease. Thus, in a study made by Gafafer (8) of 3,000 workers in a public utility over a six year period, it was found that although increasing age tends to reduce the number of illness disabilities, the average length of each disability tends to increase. This trend of increasing illness rates in older workers could certainly be changed by providing adequate programs for medical care in industry. Commercial aviation concerns have found that the useful life of their flying personnel can be significantly prolonged by the early detection of latent illness and by indoctrinating such personnel concerning factors which influence their health. Thus, most problems of sickness or absenteeism among older workers can be solved by adequate programs of medical care.

The adequate utilization of the potentialities of older workers for gainful employment will require the following: (1) careful and complete job analysis, (2) development of individual tests to assess the physiological age of various organ systems, (3) development of individual tests for performance capacity, and (4) education of the community to realize the necessity for utilizing the work capacities present in older people.

Since we know that aging produces certain changes such as sensory impairments, reduced speed of reaction and performance, it is obvious that older workers must be placed in jobs in which these factors are of minimal importance. It is unreasonable to expect a 50 or 60 year old worker to take his place on an assembly line geared to the 20 or 30 year old worker. Thus, a meticulous analysis of jobs with respect to factors such as speed, energy requirement, fatigue effects, judgment, and experience, must first be made for appropriate placement of older workers.

Because of wide individual differences in physiologic aging among persons of the same chronologic age, it is essential that tests of physiologic age be developed for various organ systems. It will also be necessary to devise more adequate methods of health examinations which will permit the early recognition of chronic disease. Methods of assessing performance capacities in individuals need to be developed as well. It is in this area that research is most urgently needed. Studies of this nature will require the active cooperation and assistance of many older people in the community. Such studies can be made only when a large number of mature individuals contribute their time and efforts to serve as subjects for experimental work. Some beginnings are being made in this direction by the Section on Gerontology of the United States Public Health Service, but the field is of such importance that many other research groups should participate in the program.

The education of the community to reject the concept that no one is capable of productive work beyond the age of 65 or 70 can be effectively forwarded by social workers as a group. The attitude of resignation and futility as well as the belief that the senile changes in old age are inevitable must be actively combated, since with the advances in medicine there is no reason people should not remain active producers in the economic life of the community well beyond the age of 65. It is necessary to recognize the fact that work output of older workers may be diminished, and therefore their remuneration may have to be adjusted. There is no reason older workers should be consigned to the economic scrap heap simply because they have attained a certain chronologic age. Because of their contacts in the community, social workers are in a strategic position to impress on older people the importance of research on

aging and to enlist the aid of older people to serve as subjects for experimental work.

Summary

The rapid increase in the proportion of older individuals in our society makes it imperative that plans be made for utilizing the capabilities of the older worker in our national economy. Our present meager knowledge indicates that aging results chiefly in a slowing of fundamental physiologic processes and that aging progresses at greatly different rates in different individuals and in different organ systems within the same individual. Research to determine the performance potentialities of older individuals is urgently needed. Such research will require the active cooperation of older individuals in the community to serve as experimental subjects. Social workers as a group are in a strategic position to impress on older persons in the community the importance and need for such research.

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The Story of Old Age

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MEDICINE AND EDUCATION HAVE INCREASED THE NUMBER OF PEOPLE WHO LIVE TO BE OLD. THE POSSIBILITY OF A LIFE EXPECTANCY BEYOND A HUNDRED YEARS MAKES URGENT A SCIENTIFIC AND CONSTRUCTIVE PROGRAM FOR ELDERS. DR. HINMAN DOES NOT BELIEVE THAT MONEY PROVIDED BY FEDERAL AND STATE GOVERNMENTS FOR FOOD AND HOUSING WILL SOLVE THE PROBLEM OF MAKING THE LATER YEARS USEFUL AND ACTIVE. HE OUTLINES A FIVE-POINT PROGRAM, THE ESSENCE OF WHICH IS EDUCATION AND LEADERSHIP PROVIDED BY THE ESTABLISHMENT OF DEPARTMENTS OF GERONTOLOGY.

THIS is the story of old age which is still in its infancy and has neither walked nor talked. Because it has just been born into the family of the sciences, the unfamiliar and unique offspring of education and medicine, the story cannot now be fully told. Its future, however, is just as certain as that of man.

Ancestors date from the very beginning of all life; birth and death being the natural lot of individuals except perhaps those, like protozoa, which multiply asexually by binary fission. Always through the age-long evolutionary changes from lowest to highest, all forms of life have come from life. During this prolonged struggle of biologic progress, an optimum degree of growth and an optimum duration of life varying with environment and circumstances (food mostly) have existed for each form. It is probable that the individual ants (whether males, females, neutral workers, or soldiers) forty million years ago when these arthropods reached the end of evolutionary change grew as large and lived as long on the average as their formic prototypes of today.

Studies by Buffon some 200 years ago established the rule of six times the period of growth as a rough estimate of the optimum length of animal life. By this rule structural maturity at 4 to 5 gives a horse from 24 to 30 years of life; at 2 to 3, a dog from 12 to 18 years of life; and at 20 to 25 when bone growth is complete, a man from 120 to 150 years of life. Some lower vertebrates, fish for instance, continue growing with age but most creatures, invertebrate and vertebrate, have an optimum growth; a size most favorable for the survival of their kind. Dwarfs and giants are unnatural and rarely live long. Homo cromagnon was bigger than Homo sapiens and size may have caused his extinction.

The size of the individuals of any species will vary considerably. Probably, certain breeds of men, like dogs, have an average for each breed. The Pygmies of Africa belong to the human species and of their kind some are large and others small but even for them there would seem to be a size most favorable for survival. Neither largeness nor smallness is an asset unless favored by the conditions of living. And now science in the recent isolation of the growth hormone from the pituitary offers the opportunity of rearing a race of giants. It might increase human efficiency, well-being and longevity, but survival of the race is the real problem. Would it help here?

Irrespective of the relation of size to survival, only a very few of the members of any animal species live the optimum period. The majority die early in the universal struggle of existence; only those so fortunate to escape disaster, and those fit to withstand it survive to old age. Premature death from violence, starvation, or disease is the common fate of all living things. The evolutionary protection of any species against extinction has been overproduction so that some members, more or less through luck and toughness, would survive to reproduce their kind. This Darwinian princi-

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ple is seen at work in India today where only one of four births survives two years and death from disease and starvation after infancy claims many children and adults. The average length of life is around twenty years, yet, because of an astounding fertility (overproduction) the population increased fifty million in the ten years 1930 to 1940. In America, even with a diminishing birth rate and no immigration, the population increased in the same decade a little over 7 per cent. This increase was due largely to the sudden appearance in our social structure of the old age of this story.

At the beginning of this period, a colleague (2) said: "Only a few of those born into the world survive the vicissitudes of infancy, childhood and maturity, and this, by the way, is most fortunate; for otherwise if all lived to be old and the burden of caring for them in their increasing helplessness were thus added to the burden of caring for the helpless young, this would be a much harder world for those in their prime." This misfortune is now upon us, and it looks as if it will get harder and harder for those in their prime unless we do something about it. At the beginning of the Eighteenth Century the population of the world was less than half a billion. Then the mechanical revolution, with more food for all, brought about an increase in the total number of our species to more than two billion, a five-fold increase in 200 years. One wonders whether the current scientific era with its coming atomic phase will increase world population much as the mechanical revolution has increased it. Surely society knows more than it did then, and common sense cries out for quality in the future, not quantity as in the past. Whatever happens in the way of production will not change this story about old age.

It has always been man's ambition to do the seeming impossible—to square the circle, to discover the secret of perpetual motion, to find an elixir of life, or to create a fountain of youth. So unbelievable have been many of their recent discoveries, however, that scientists are beginning to doubt a realm of the unknowable. Medicine has gone along in this unraveling of nature's secrets, applying new found facts of pure science to the study of disease and discovering in turn causes and cures, to become more responsible than any other human discipline for the extremity in which civilization now finds itself. Humanity teems with the survival of the unfittest through circumvention of the fundamental laws of nature; allowing morons, imbeciles, and even the insane to reproduce; protecting the criminals and the mental cataleptics. Society is abetted all along the way by the fast growing efficiency of medicine in keeping all these unfit alive, until the mass of human intelligence is fast going down hill.

An awakening, hopefully in time, is at hand through the scientific regulation of reproduction by contraception, sterilization, and possibly euthanasia, at least therapeutically through laws allowing doctors to clip the known unfit at birth. Nevertheless medicine and education still flout nature by keeping everybody, the fit and the unfit, alive longer and longer. In civilized countries the struggle against famine and disease is no longer won by individual luck and strength. Science supplies plenty of food and medicine, teaches the necessary rules of sanitation and hygiene, provides an ever widening artificial immunity, and comes in at need with a specific cure, not for every disease, but advances are so rapid as to encourage the belief in soon finding one for those still incurable, such as cancer, arteriosclerosis, and heart disease. You discover, I think, how medicine and education

just recently became the parents of the Old Age of this story.

This is what happened. The expectancy of life in the Roman Empire was about 23 years. It was 47 years in the United States at the start of the twentieth century. Today it is over 65. The result, of course, is a sudden and singular increase in the proportion of elders in our population. Education and medicine have added twenty years to the expectancy of life within the last half century. In 1900 only 17 per cent, but in 1940 over 26 per cent of the population was over 45 years of age. Today there are more than 14 million elders in this country, and by 1980 when our population reaches an estimated maximum of around 154,000,000 and life expectancy will have increased five more years to around 70, more than 26,000,000 of our citizens will be over 65 years of age.

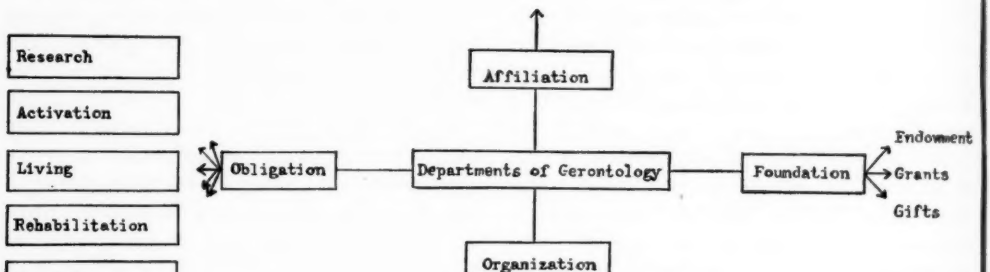
But this is not all. Suppose that the civilization of which we are a part has muffed the biologic optimum of longevity, as seems likely after reading a recent news item which tells about the finding in a small village of the Caucasus of as many as thirty five persons between the ages of 113 and 136 years, and suppose civilization soon finds out why this optimum of longevity has been missed. When expectancy goes beyond the century mark as doctors now believe it most certainly will, this will truly be a country of elders. The failure so far to live our biologic optimum may well be due to poor and misdirected stewardship and is not beyond correction if we so wish. After all, man barely realizes his utter responsibility for all life on earth including his own.

The human brain which makes man the trustee of future evolution must have made biologic mistakes in developing the human values which make men different from animals and these mistakes, no doubt, have lowered the optimum of human intelligence and of life expectancy. Medicine and education have not lengthened life. They have increased the number of people who live to be old, thereby starting a new chapter in the history of man, whose own future will mould the future of all life on earth, because from now on whether evolution is upwards or downwards, whether progressive or degenerative, the brain of man alone will be responsible. Huxley tells us that the potentials of growth and progress of the human brain as yet are barely perceived. The mere possibility of an expectancy beyond the century mark makes the need of a scientific and constructive program for elders that much more urgent.

Aging starts at birth and goes on through infancy, adolescence, maturity, senescence, and senility to death. As old as your arteries is axiomatic and arteries sclerose from both congenital and acquired causes. Whoever would live to be old should choose parents and grandparents who died old and should evade undue and prolonged strain, both mental and physical. The periods of life are by no means chronologic. In some people the particular combination of hereditary and environmental factors causes an early senescence but delays the onset in others to beyond sixty or seventy. It is first manifest in a physical decline, but the power of intellect of the normal elder diminishes very gradually with age and when exercised and stimulated has shown unexpected vitality and even originality. We speak here of the healthy elder still free of the major physical limitations and in need of something to do which is worthy because if left out, idle and bored, he will either get sick or go crazy. Already our asylums overflow with the victims of arteriosclerotic and senile psychoses, much of which might have been prevented if we had more knowledge of cause and effect.

The physical let-down with senescence is largely mental. Frustration, discouragement, unhappiness, and fear are the hazards which lead to loss of appetite, insomnia, apathy, and then the physical break-up. In contrast to "as old as your arteries," is the other truism: "as young as your mind." One can keep young in spite of years and its physical burdens and always have new fields to conquer. Life is change, and aging, when not permitted to mean the end of progress, is still living and subject to change. The apprehensions and

dangers of senescence arise from within, and the ounce of prevention must come from within. Some people grow old naturally without a thought; others early begin dreading it, and fear makes them old before their time. The fountain of youth is in the head, an inner urge, a thirst for living, a subconscious philosophy. Josiah Royce has said: "You philosophize when you reflect critically upon what you are doing in your world. And what you are doing is, of course, in the first place living, and living involves passions, faiths, doubts, and courage. The critical inquiry into what these mean and imply is philosophy."



Living also involves action. This is one law of nature, created by man when he became different from animals, which he cannot neglect. Either he keeps doing or he stagnates. And fortunately for man, doing can be mental as well as physical. The bright and busy minds of men and women with hoary heads keep them young. The elixir of life is mental action and acquisition. Keep awake. Never say die. Get out of a rut. Break the routine. Try something new. Here is where enforced retirement can be made into a blessing in disguise. It is never too late to begin making life more interesting, and this enforced adjustment may be the starting point for many activities. Creative hobbies for the aged which will keep both hands and brains busy are as yet unexplored.

What then is to be the future of this infant of civilization growing up by leaps and bounds? That it has a future seems established by the fact that the five-fold increase in the ten years 1930 to 1940 of the number of elders over that of our total population is just a beginning. Senescence can no longer be neglected as in the past. Federal and state maternalism will not solve the problem. Our government is now spending more than $400,000,000 annually for old age assistance. Money for food and housing is not the answer. A plan is needed which will make useful and active the later years of life everyone in this country now faces. The following one, outlined in the accompanying chart, indicates how society can meet this need, salvage the aged, and benefit in return.

The essence of this plan is education. Departments of Gerontology, endowed either independently or in affiliation with established centers of learning such as the high schools, colleges, universities, and institutes of trade and technology, will start the study and research of old-age; will furnish the opportunities for mental and manual activation, will discover a practical way of a happy cooperative living, and will provide security and care for the helpless senile. Newspapers, radio broadcasts, and magazine articles will spread this gospel of activation so that every mature individual will begin planning for these opportunities and activities long before senescence comes. Once people realize they can be useful and happy while growing old, this period of life will be looked forward to with hope and satisfaction and not with fear and dread as in the past.

Research in gerontology is a new and open field with many closely interrelated

social and biologic aspects. The recent remarkable increase of life expectancy is due to social factors making a biologic one effective. Better medicine, the biologic factor, prolongs life only when education (in sanitation, quarantine, immunization, and other measures of public health), the social factor, makes it possible. None but civilized peoples have an old age problem.

Innumerable social aspects of aging are in need of study. Scientific inquiry into the operations, powers, and functions of the minds of elders comes first. The capabilities and inabilities of older brains must be studied psychologically. Doubt and fear will give way to hope and courage. The idea that a person gets too old to learn is not true. Anyone who tries hard enough can do it, and all elders need is encouragement and advice for the effort and its direction. Psychologists will devise tests of intelligence, of aptitude, and of interest which will point the way but action itself must come from within. Those older people who really prefer idleness and stagnation are abnormal and are as much in need of psychoanalysis as any real psychotic. The study and cure of idleness is another instance of social and biologic partnership. Although they do not go as far as the Christian Scientists in application, doctors have long recognized the power of mind over matter. Success in the practice of medicine comes best to the physician with both heart and head, and this principle is now scientifically practiced in a new specialty called psychosomatic medicine.

Thus, the joint study of elders by doctors and psychologists will discover these internal changes of aging, their average time of onset, and how they affect intellect, memory, and creative thought. It will reveal the internal effects of necessary adjustments to retirement, to the loss of the home, of old friends, and of prestige, and to the growing sense of dependence. It will uncover the changes of personality with the climacteric and the physical degenerations. The potential benefits of psychologic research of aging are most expedient at this new birth of old age.

The social side of aging can no longer be neglected and requires first of all scientific study. Who are these people who cling so long to life? What is their background, their parentage, their environment? What have they been doing all their lives? The whole list in our population must be completed, classified, and analyzed. From this study will come methods and means of helping them to fully live the lengthened period of life.

These studies of the social disciplines of elders should stimulate investigations in other social sciences which to date are almost negligible and so far behind the advance of pure science as to make precarious this top-heavy scientific era we live in. Particularly apprehensive of the near future have been anthropologists like Hooten (*Man's Poor Relations*) and Estabrook (*Man the Mechanical Misfit*) who are most articulate on social suicide. Research in social science is work suitable for the mature intellect and wisdom of elders, and work which would not only activate them but would benefit humanity.

The great activity in biologic research, however, will not slow down for social science to catch up. A new specialty, Geriatrics, which treats of the diseases of old age, is a response to the medical needs arising from the recent increase in expectancy of life. The mental and physical problems of aging have always interested medical men, and larger and larger sums of public and private money are being donated and spent on finding the cause and cure of the three men of death during senescence—cancer, arteriosclerosis, and heart disease.

Psychiatry, which treats of the diseases of the mind, is making progress in the study of old age psychoses, particularly the arteriosclerotic and senile types, and is arousing public interest in the intensive decline in the mentality of youth, most of whom will grow to be old. Psychiatric research from youth to old age will help formulate the race-saving policy of breeding for quality, not quantity. The mental hazards of youth—stupidity, delinquency, improvidence, crime, psychosis, insanity—are more

hereditary than environmental, and psychologists, psychiatrists, and the geneticists must find the reason for this defect with birth. Most of these sins against society are mental sicknesses. These people are ill and, unfortunately, were born that way.

Physiologists and biochemists with their colleagues in clinical medicine, some of whom specialize in this field and call themselves endocrinologists, are correlating the magic hormones with the processes of aging. Studies of the influence on life of the male and female sex hormones fill pages upon pages of the medical literature and spill over, usually garbled, into the public press occasionally. Voronoff's heyday of gonadal transplants is now desolate. Steinach's vaunted rejuvenating vasal ligations are now used only as prevention of swollen testicles in men with prostatism. But the friend of the individual, the doctor, is not discouraged, and with his many scientific helpers has barely started on his search for the means to keep everyone alive the optimum period. The medical aspect of aging is life itself, and the social problem is to keep every individual living, meaning more than just being alive, so long as life lasts.

All of the foregoing considerations of benefiting individuals disregard the fundamental grievance of anthropologists: going in the face of nature to the detriment of the race. This eugenic problem is hidden behind the human values which man has evolved and which are fast making him altruistic. But, mere thought of this problem opens up to view many broad fields of research in heredity and genetics with practical application.

This brief discussion is meant merely to outline the possibilities and the needs of scientific research of aging. A practical purpose of departments of gerontology would be to offer to healthy elders an opportunity of education and training in both the mental and manual disciplines of human activity. Research will establish methods by which an elder's abilities, limitations, and interests can be determined. Education will have taught everyone around the age of forty to plan for senescence by developing hobbies, and this period will then be looked forward to and will become the most satisfying part of everybody's life.

When retirement comes, some people can go back to school to study, or to develop the ideas till now back of their minds; and others can be encouraged to undertake what the tests show them most capable of doing. These are the first two projects of gerontology. Training should be open to everyone irrespective of educational background. The successful oldster who never went to college might want an A.B. degree or to do some piece of research. Entrance requirements would need revision here. The idea back of this purpose is the activation of elders—mentally, as students, teachers, or research specialists and, manually, as skilled workmen in wood, leather, plaster, or what-not.

A third project of gerontology will be the development by the practical experience of trial and error of an ideal living environment for elders where they might retain their individuality as Mr. or Mrs. So and So and not be just his father or her mother; where they would be active and useful, would have amusements and recreation, and where the majority would have the time of their lives. It would be an experimental search for a way of life most suitable for healthy elders. Like birds of a feather, the individuals will flock together into groups of cooperative living.

A fourth objective of gerontology will be rehabilitation. Geriatricians in special hospitals or convalescent homes will care for elders who get sick and nurse them back to health. Each elder should get regular physical check-ups and when necessary an ounce of prevention in time to be effective.

A fifth purpose of gerontology will be to determine when a person should be institutionalized and then to provide a place and the means to care for those who are helpless and hopelessly incapacitated, the truly senile.

This brief outline of some of the obligations which departments of gerontology can fulfill at least opens up a new point of

view for elders. Whatever the way of life in the past, every individual who does not die in the well-worn harness faces a future adjustment. Change in living is as inevitable with senescence as death at the end. Advance warning of this period is rarely recognized and its insidious onset may bring distress and bitterness instead of hope and relief. Right now insurance statistics show that at age 60, life expectancy is 19 years, at age 65, 15 years and at age 70, 11 years. All are periods long enough to be well worth planning for ahead of time. Elders, unlike youth, need no help. Experience, intelligence, and even a little wisdom will have prepared them to take care of themselves once they realize the necessity and begin doing something about it.

After all this story of old age turns out to to be an introduction. Hopeful possibilities of progress have been apprehended but, as the story develops chapter by chapter in the future history of mankind, it may disclose the same neglected uninteresting senescence with which we are now familiar. As in the past, most people who will live to die of old age will continue to get no vital satisfaction or to give any lasting benefit from this longevity. Removed from life's competition, secure in food and shelter, comfortable but bored, they will line themselves up on the firing line, marking time through the twenty to twenty-five years of senescence just piddling around, to face with surprising indifference the fatal shot.

Perhaps, however, some chapters yet to be written of old age will be filled with actions and crowded with incidents, which show change and progress. There is no earthly reason not to believe that the infant science of gerontology will not produce surprises and play such a leading part in the evolution of man during the atomic era as to make the story, chapter by chapter, intensely interesting and exciting.

Summary

Out of necessity the science of gerontology has sprung into being. Medicine and education have increased the number of people who live to be old. When they combine to increase the span of life expectancy to the biologic optimum, the problem of an aging population will be greatly increased. The problem can be met by:

1. Research. Departments of gerontology, endowed either independently or affiliated with established centers of learning, should be organized to provide for research in all of the sciences related to aging—biologic and sociologic.

2. Activation. A practical purpose of the departments of gerontology would be the activation of elders, mentally and physically.

3. Living. The departments of gerontology would evolve an ideal living environment for elders where they would be active and useful individuals.

4. Rehabilitation. The departments of gerontology would provide geriatricians to care for the aged ill.

5. Provision. The departments of gerontology would provide care for the truly senile.

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The Effect of Age on the Concentration of Chloride and Water in Chick Tissues

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EXPERIMENTS BY BARLOW, SLINGER, AND MANERY, ON CHICKS FROM HATCHING TO 1825 DAYS OF AGE, SHOW THAT THERE IS A RAPID DECREASE IN THE WATER AND CHLORIDE CONCENTRATIONS OF SKIN AND MUSCLE DURING THE FIRST MONTH AFTER HATCHING. MORE GRADUAL DECREASES WERE FOUND IN TENDON WATER AND CHLORIDE.

FROM HISTOCHEMICAL CALCULATIONS APPLIED TO THESE ANALYSES IT IS SUGGESTED THAT TISSUES OF YOUNG BIRDS CONTAIN A MUCH LARGER EXTRACELLULAR SPACE THAN THOSE OF OLDER BIRDS.

HUMAN MUSCLE AND RAT MUSCLE HAVE BEEN REPORTED TO INCREASE IN CHLORIDE CONCENTRATION IN THE PERIOD OF SENESCENCE, WHEREAS IN OLDER CHICKS A DROP OCCURRED. ALTHOUGH DESICCATION OF TISSUES HAS LONG BEEN CONSIDERED TO ACCOMPANY SENILITY, THIS WAS NOT TRUE OF THE MUSCLFS OF THE OLDER BIRDS, AND ONLY A SMALL DECREASE IN WATER WAS OBSERVED IN THE CONNECTIVE TISSUES STUDIED.

THIS investigation was undertaken in order to establish the normal chloride and water concentrations of certain chicken tissues during development, i.e. from hatching to a period approaching senility. Serum, skin, tendon, and breast muscle were analysed for chloride and water during the interval in the life cycle of chicks commencing with hatching and terminating after the period of maximum egg production. The most striking changes occurred during the first month after hatching. The concentrations of both water and chloride dropped rapidly in this interval and then remained constant until the birds were past the prime of life, when a slight decrease occurred. Similar events probably occur in mammals, but in the available literature emphasis has been placed on late maturity and senescence, and the very early stages of development have generally been ignored. Hines and Knowlton (2), however, have reported alterations in the chloride and water concentrations of muscles of rats between 15 and 60 days of age which are comparable in magnitude to those found in chicks during the first thirty days following hatching.

MATERIALS AND METHODS

Chickens offer particular advantages for studies of this nature, especially in embryonic and posthatching stages. First, large numbers of uniform breeding are available and are easily maintained under identical conditions. Second, tissues in early stages of growth are more easily procured in large quantities than from growing mammals. Third, the same batch of eggs may be used to supply all stages of development from incubation to senility.

The growing period of the chicks formed the basis of the study, but a limited number of birds were kept much longer in order to establish whether or not there were changes concomitant with maturity and aging. The experiments were carried out with White Leghorn chickens of the Ontario Agricultural College strain. A few birds were kept for 730, 1095, 1460, and 1825 days. These were reared in accordance with generally accepted methods for commercial poultry production. All younger birds were of one hatching and were reared under identical conditions; they were maintained during the early stages of growth in electrically heated battery brooders and during the later stages in growing batteries in a room kept at constant temperature.

The chicks were killed by decapitation and bled directly into 15 ml. centrifuge tubes. To prevent the gastric juices from

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Mr. J. S. Slinger of the Department of Poultry Husbandry, Ontario Agricultural College, received his B.S.A. degree from that College in 1937 and his M.S.A. from the Department of Biochemistry, University of Toronto, in 1941. His researches have included studies of electrolytes in development, various aspects of poultry nutrition, and vitamin assays.

Dr. J. F. Manery of the Department of Biochemistry, University of Toronto, received a B.A. degree in 1932, an M.A. in 1933 and a Ph.D. in 1935 from the University of Toronto. She was a National Research Council Fellow in the Biological Sciences at Harvard Medical School, Department of Biochemistry in 1936, and was engaged in teaching and research in the Department of Physiology, University of Rochester, New York, in 1935 and from 1937 to 1939. Researches have included electrolyte studies in developing embryos and in adult tissues, certain aspects of shock, and the mechanism of cell membrane formation.

This research was carried out in the Departments of Animal Nutrition and Poultry Husbandry, Ontario Agricultural College, Guelph, Ontario, and the Department of Biochemistry, University of Toronto, Toronto, Ontario. The work formed a part of the undergraduate thesis of J. S. Barlow, submitted in partial fulfilment of the requirements for the degree of Bachelor of Science of Agriculture, 1942.

contaminating the blood, the skin at the back of the neck was first cut and pulled back to allow separation of the trachea and the oesophageal tube from the cervical column before it was severed. For the most part 0.5 ml. aliquots of serum were taken for analysis.

In the groups of chicks older than 24 days the tissues and serum of each bird were analysed separately. Sometimes insufficient quantities of skin and tendon were obtained for analyses from younger birds, and in these instances tissues from 2 or 3 individuals were pooled. Samples of skin were taken from the area beneath the left wing. Since this region is relatively free from feathers, it is easy to pluck, and because it contains less fat than other skin areas, it was more suitable for our purpose. Tendon was obtained as follows: scissors were inserted between the tendon and the tarsometatarsus, just above the foot, and the bone cut. The foot was pulled away, drawing the tendon with it. The tendon was then cut free and placed in a weighing bottle. Tendons were taken from each leg, one being used for water content and the other for chloride determination. In the case of breast muscle, the skin was drawn back and samples dissected immediately—from one side of the breast for water and from the other side for chloride analyses.

The deposition of variable amounts of fat in the skin during growth made it imperative to remove the fat from this tissue in order to obtain comparable results. Fat was extracted with dry ethyl ether in a Soxhlet apparatus for twenty-four hours. Qualitative chloride analyses on the extract showed that no appreciable amount of chloride was lost in the extraction.

The water content of all tissues was obtained by drying to constant weight in an oven maintained at 100 to 103 C. Chloride was determined by the method of Van Slyke (10) with the modification of Wilson and Ball (11).

Results

A growth curve for White Leghorn chickens was constructed, based on the average weights of equal numbers of male and female birds, and was found to be typical. Since egg laying commences at about 160 days, the chickens are said to have then reached maturity, although they may still continue to increase in weight for about the next sixty days. At about 500 days of age, the birds are beyond the period of maximum productivity of eggs, and are then arbitrarily considered to have passed the prime of life. Since egg production contin-

TABLE 1. CHLORIDE AND WATER CONCENTRATIONS IN SERA AND TISSUES

Birds		Serum		Skin		Tendon		Muscle	
Age days	No.	H_2O gm.	Cl. mEq.	H_2O gm.	Cl. mEq.	H_2O gm.	Cl mEq.	H_2O gm.	Cl mEq.
3	10	947	120.4	831	92.1	773	75.6	835	52.8
	σ	1.0	6.5	17	9.4	9	6.9	19	7.5
7	10	956	122.4			759	77.2	826	31.5
	σ	0.3	4.9			5	2.0	16	6.7
10	10		120.4			754	75.0		
	σ		6.4			0	4.3		
14	10		125.0	837	79.6	747	71.2		
	σ		3.6	27	1.3	7	2.4		
17	10		121.0	807	81.9	728	7.46		
	σ		6.6	13	5.8	3	2.7		
21	10		126.6	773	67.8	735	76.3		
	σ		2.9	10	4.9	4	4.6		
24	10		133.4	773	79.3	722	80.7		
	σ		4.0	0	2.0	8	1.3		
28	10	955	133.8	763	73.4	716	74.7	772	19.4
	σ	0.5	5.2	10	5.9	15	3.9	10	2.0
33	10		128.2	760	77.9	707	81.8		
	σ		3.2	11	3.9	17	4.7		
38	10		127.7	754	76.3	712	71.5		
	σ		2.9	6	5.7	9	5.1		
45	10		129.0	702	65.4	692	76.6		
	σ		3.9	33	5.3	8	1.7		
54	10		124.6	766	64.1	691	78.3		
	σ		2.2	10	5.9	9	1.0		
63	10		127.2	717	74.2	683	75.5		
	σ		4.0	19	2.7	12	1.4		
70	10		130.8	727	72.1	684	77.7		
	σ		3.6	14	5.7	9	1.9		
124	10	934	139.5	724	81.6	643	78.3	731	17.9
	σ	2.0	8.6	33	7.7	17	10.0	7	1.5
270	4	929	152.6	555	80.5	624	72.5	738	9.1
427	4	922	137.0	709	84.0	524	66.1	731	14.9
566	1 ♂	939	124.1	672	77.6	575	77.6	727	5.2
566	1 ♀	876	117.1	705	71.6	600	64.1	721	8.8
730	1 ♀	896	124.7	676	75.7	607	68.8	737	10.1
1095	1 ♀	908	137.8	706	69.0	594	71.6	734	7.9
1460	1 ♀	891	115.1	724	66.4	619	64.5	757	13.7
1825	1 ♀	894	118.2						

Figures represent gm. or mEq. per kg. of fresh tissue except those pertaining to skin, which are expressed in gm. or mEq. per kg. fat-free wet weight. Muscle refers to breast muscle. σ represents standard deviation.

ues for two to four years, although at a substantially reduced rate, it is questionable whether the deceleration in reproduction occurring at about 500 days of age can actually be taken to indicate the onset of aging, especially when it is noted that chicks may live for several years after they stop laying. For purposes of this discussion, however, it is assumed that the birds 556 days of age and older are aging, that birds between 427 and 270 days old are mature or in the middle period of life but not yet aging, and that all younger are in the growing stage.

The results of the chloride and water analyses are presented in table 1. The values reported for all birds younger than 270 days are averages of determinations on

10 chickens—5 males and 5 females. Where 10 individuals of a given age were used duplicate analyses on each tissue were not considered necessary. When only one bird was used values reported are the averages of duplicate samples from each bird. The results obtained on older birds are therefore variable, and small differences due to age may occur which are not demonstrated. The variation in the earlier data is due to changes related to the time of day which in some cases amounted to 7 to 10 per cent. In later experiments all chicks were killed at an arbitrarily selected time each day.

The data demonstrate that there is a decrease in the water concentration of skin, tendon, and breast muscle during the period of growth, the most rapid fall occurring in the first month after hatching. The percentage of water in breast muscle decreased from 84 to 77 per cent of the wet weight in the first twenty-eight days, in tendon from 77 to 68 per cent of the wet weight, and in skin from 83 to 73 per cent of the fat-free wet weight in the first seventy days. Thereafter the rate of decrease was much less until in older birds (566 to 1460 days inclusive) average concentrations of water of 74, 60 and 70 per cent were reached in muscle, tendon, and skin respectively. The serum water likewise decreased from 95 per cent in the first three weeks to about 90 per cent in the aged birds.

The tissues of young mammals also show a decrease in water content soon after birth in a fashion comparable to that manifested in chicks. This is best illustrated by the data of Lowrey (4), who found that in young rats, in the first twenty days after birth, the water concentration dropped from 89 to 77 per cent of the wet weight in muscle, from 88 to 59 per cent in skin, and from 88 to 70 per cent in the body as a whole. The desiccation which has formerly been considered to accompany senility in mammals was not evident, however, in our data on chicks. Perhaps these birds were not actually experiencing processes accompanying senescence. Simms and Stollman (9) likewise were unable to demonstrate a lower water concentration in the tissues of humans 70 years of age than in those of individuals 30 to 40 years old, and Lowry, Hastings, and Brown (6) did not find evidence of desiccation in rats in senility. In reviewing this subject Lowry and Hastings (5) question the occurrence of dehydration of tissues in old age.

Accompanying the decrease in water concentration in skin and muscle during the first month, there was an appreciable drop in chloride concentration—in the skin from 90 to 70 mEq. per kg. and in muscle from 50 to 20 mEq. per kg. No such decrease was found in tendon in the early stages This early rapid fall in chloride concentration in muscle, which we have seen in chicks and which Hines and Knowlton (2) have reported for rats, is not to be found in the data of Yannet and Darrow (12) for cats or in that of Lowry, Hastings, and Brown (6) for rats, probably due to the fact that the very early stages were not examined. Human muscle (9) and rat muscle (6) are reported to increase in chloride concentration in the period of senescence whereas in the older chicks examined a drop occurred—to 9 mEq. per kg. in muscle and to 70 mEq. per kg. in tendon.

In experiments to be published later, we observed that chicks raised on high salt diets showed signs of oedema and died more rapidly during the first two or three weeks after hatching than during later stages of development. It seems possible that the high susceptibility at this time might be related to the tendency toward an oedematous condition which occurs normally, and which is manifested by the high chloride and water content of the tissues.

The chloride of skin behaves in a different fashion from that of tendon or muscle. It seems to rise in concentration in middle life and to fall again in sensecence. In so doing it follows the course of the serum chloride. This finding is not surprising since skin contains an appreciable quantity of extracellular water which is, for the most part, derived from plasma.

The solid content of the serum of our chicks increased by at least 5 per cent during the period studied. Heller and Pursell

(1) reported a smaller increase in the solid content of the sera of Rhode Island Reds between the end of the first and the twenty-seventh month. They did not find the increased serum chloride concentration which is evident in our data. An increase in serum proteins has formerly been reported to occur in growing mammals.

In order to determine certain histochemical changes associated with growth and aging in these tissues, the volume of extracellular water—$[H_2O]_E$—has been calculated by the method used by Manery and Hastings (7). This method assumes that all the chloride is extracellular and that it is present in the extracellular fluid at the same concentration as in the plasma ultrafiltrate (Gibbs-Donnan ratio 0.95). Values for the percentage of water in the sera are necessary for this calculation; these were obtained by extrapolation from the data in the table when not determined experimentally. Calculated values of $[H_2O]_E$, based on the assumption that all the tissue chloride is extracellular, have been plotted in the figure. During the first month after hatching the volume of extracellular water dropped in a striking fashion in both skin and muscle—in skin from 69 to about 50 per cent of the weight of the tissue and in muscle from 40 to 13 per cent. In tendon there was a more gradual decrease over the entire interval studied, but the total change was appreciable, being from about 56 to 45 per cent. A decrease in the chloride concentration of the whole embryo during early development has often been observed (3).

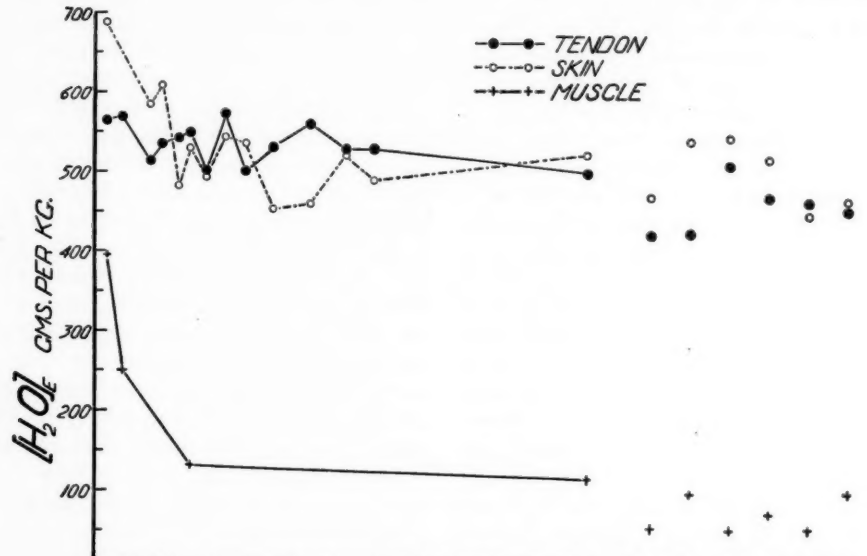

FIG. 1. Calculated quantities of extracellular water, $[H_2O]_E$ in gm. per kg. fresh tissue, are plotted against time after hatching, in days.

Although the theory that all chloride is extracellular in muscle of adult organisms is well founded, there is no experimental justification for applying it to embryo tissues. The high chloride content of young muscles could result either from a large extracellular space or from muscle fibres which contained chloride. The latter possibility seems most unlikely because it implies such a fundamental structural difference between young muscle fibres, which function quite competently, and those of

adult tissues. A large extracellular space would occur if there were relatively few well developed muscle fibres with a proportionately large amount of extracellular space between them. Arguing from analogy with mammals the latter interpretation seems to be the more reasonable. We do not know whether, at this stage of development in the chick, muscular growth is entirely due to enlargement of preexisting fibres or partly due to fibre splitting or differentiation of new myoblasts from the adjacent mesenchyme. A section of embryo rat muscle showed many small fibres so loosely packed that the total extracellular space seemed to be large. This is also shown in the figure on page 169 of reference (8). It was of some interest to note that the fibres themselves were not solid but each showed a central canal of cytoplasm with myofibrils about the periphery indicating that the hydration of young muscles might be intracellular as well as extracellular. Without the necessary histologic and permeability studies the chloride of these young chick muscles cannot be accurately located, but, at the present time, an extracellular site seems to be the most reasonable. In the skin and tendon it seems likely that extracellular solids and mucoid invaded the tissue as time progressed and caused the subsequent desiccation of the extracellular phase.

Summary

Chloride and water concentrations were examined in chicken tissues during growth, middle age, and a period past the prime of life. The greatest change, which was a decrease in these constituents, occurred in muscle and skin during the first month after hatching; this was sufficient to alter the calculated volume of the extracellular water from 40 to 13 per cent in muscle and from 69 to 50 per cent in skin. In tendon a total change of from 56 to 45 per cent was found but it occurred gradually over the entire period studied.

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The Effects of Androsterone, Oestradiol, and Thyroid Hormone on the Artificial Premature "Climacteric" of Pure Gonadal Origin Produced by Ovariectomy in Rats

III. Effects on Histologic Structure of Vagina, Uterus, Adrenals, and Thyroid

V. KORENCHEVSKY AND VERA E. JONES

THIS PAPER IS THE THIRD IN A SERIES REPORTING THE EFFECTS OF SEX AND VARIOUS HORMONES ON THE GROSS AND MICROSCOPIC CHARACTERISTICS OF VARIOUS ORGANS OF RATS IN WHICH AN ARTIFICIAL CLIMATERIC WAS PRODUCED BY OVARIECTOMY. THE FIRST PAPER DISCUSSED THE EFFECTS ON WEIGHTS OF ORGANS, THE SECOND, THE EFFECTS ON THE HISTOLOGIC STRUCTURE OF LIVER AND KIDNEYS, AND THE PRESENT ARTICLE THE HISTOLOGIC CHANGES IN UTERUS, VAGINA, THYROID, AND ADRENALS. DR. KORENCHEVSKY FOUND THAT IN GENERAL THE CORRELATIVE EFFECTS OF THE HORMONES INDICATED THAT THEIR STIMULATING AND POSSIBLY ANTI-AGING ACTION ON THE UTERUS, VAGINA, AND ADRENALS PRODUCED HYPERTROPHIC CHANGES OF THE NORMAL TYPE. IN THE CASE OF THE THYROID ONLY ANDROGEN, OF THE THREE HORMONES USED, PRODUCED SOME WEAK STIMULATING EFFECT.

IN OUR previous papers in this Journal (31, 42) the effects of sex and thyroid hormones on the weight of organs and on the histologic structure of liver and kidneys were investigated on rats in which a premature artificial "climacteric" had been produced by ovariectomy. Androsterone was chosen as an androgenic hormone because it is naturally present in the female organism. In the present paper a histologic examination of uterus, vagina, thyroid, and adrenals has been made on the same 119 rats (11 normal controls, 15 ovariectomised controls, and 93 ovariectomised hormone-treated rats) described in the previously mentioned papers.

As before, the literature referring to each organ investigated, will precede the description of the results obtained and will be limited to investigations made on ovariectomised rats only, with a few unavoidable exceptions.

METHODS

The general technique has been described in our preceding papers (31, 42). The arrangement of the two experiments into different groups, the weights of organs and the doses of the hormones used are given in tables 1 and 2.

The organs were fixed in Bouin's fixative, embedded in paraffin, the sections cut at 5μ thickness and stained with Ehrlich's haematoxylin and eosin after previous mordanting for about fourteen hours in a solution composed of iron alum 2 gm., sulphuric acid 2 cc., and distilled water 100 cc. After mordanting and before staining with haematoxylin the sections were washed for about forty-five minutes in running tap water. Frozen sections were also cut and were stained for fatty substances with sudan black.

For the measurement of cortical zones and medulla of adrenals the same method

Dr. V. Korenchevsky, a Russian by birth, was formerly professor of experimental pathology at the Imperial Medical Academy in Petrograd. He received his M.D. degree from Moscow University. In 1920 he emigrated to England, becoming a naturalized British citizen. He was senior research worker at the Lister Institute of Preventive Medicine in London. He was an initiator of and active in the foundation, in 1939, of the Club for Research on Ageing, with branches in Europe, the United States, and Argentina. Dr. Korenchevsky is now Hon. Secretary of the British branch. In 1945 he was appointed head of the Gerontological Research Unit at Oxford, establishment of which was made possible by a grant from Lord Nuffield. Hospitality has been extended to the Unit by Prof. A. C. Hardy and Prof. E. G. T. Liddell of the department of zoology and department of physiology at Oxford University. The subjects of research in which Dr. Korenchevsky is most interested include endocrinology, the study of vitamins, and gerontology.

Dr. Vera Jones obtained her B.Sc. degree in zoology in 1941 and her Ph.D. degree in 1944 at Liverpool University. She has been a research worker at Liverpool University and at Reading University, National Institute for Research in Dairying. Since January, 1945, she has been with the Gerontological Research Unit at Oxford University. Her work has been chiefly with cancer research and gerontology.

was employed as that used for liver and kidney cells, described in our previous paper (31, 42). In the widest cross section of adrenals the zones were outlined on special paper, with the aid of a microprojector, at a magnification of 24. These paper replicas were then cut out, weighed, and corrected to a standard weight of paper. Since in the adrenals the data obtained in both experiments were remarkably close and with only a small range of variation within groups, the results obtained in both experiments were pooled and are given in table 3. The following average figures for the groups of ovariectomised control rats give some idea of the closeness of the results obtained in experiments I and II respectively—weight of medulla was 34 and 36 mg., z. glomerulosa—16 and 15 mg., z. fasciculata—103 and 103 mg., z. reticularis —64 and 64 mg.

All illustrations are photomicrographs, and an approximate estimation of the size of the cells was obtained from them when they were of suitable magnification. No accurate measurement of the cells or their nuclei was made. Such a measurement, however, by the method of paper replicas was made in another experiment in which the same hormones were used in similar doses. The results obtained in this way for the changes in size of the fasciculata cells

TABLE 1. EFFECT OF ANDROGENIC, OESTROGENIC AND THYROID HORMONES ADMINISTERED SEPARATELY OR SIMULTANEOUSLY ON ACTUAL WEIGHT OF ORGANS (EXPERIMENT 1)

Weekly doses of hormones: Desiccated thyroid 105 mg. = "small dose"; Oestradiol B.B. 0.015 mg. injected for first 3 weeks only = "small dose"; Oestradiol B.B. 0.09 mg. injected every week = "large dose"; Androsterone 4.5 mg.

Organs (mg.)	Ovariectomised Controls	Thyroid Hormone (Small Dose)	Oestradiol B.B. (Small Dose)		Oestradiol B.B. (Large Dose)		Androsterone		
			Alone	+Thyroid Hormone (Small) Dose)	Alone	+Thyroid Hormone (Small Dose)	Alone	+Thyroid Hormone (Small Dose)	+Thyroid Hormone +Oestradiol B.B. (Small Doses)
Uterus	33	39	191	220	239	240	36	40	240
Vagina	158	187	273	304	270	273	247	224	333
Adrenals	58	63	55	84	80	91	49	52	77
Thyroid	19	18	18	18	18	17	20	21	22
Number of Rats in each Group	8	10	5	5	4	5	6	6	7

TABLE 2. EFFECT OF ANDROGENIC, OESTROGENIC AND THYROID HORMONES ADMINISTERED SEPARATELY OR SIMULTANEOUSLY ON ACTUAL WEIGHT OF ORGANS (EXPERIMENT 2)

Weekly doses of hormones: Desiccated thyroid 250 mg. + Thyroxine 0.8 mg. = "thyroid large dose"; Oestradiol B.B. 0.015 mg. injected for first 3 weeks and 2 last weeks = "medium dose"; Oestradiol B.B. 0.09 mg. injected every week = "large dose"; Androsterone 4.5 mg.

Organs (mg.)	Normal Controls	Ovariectomised Controls	Thyroid Hormone (Large Dose)	Oestradiol B.B. (Medium Dose)		Oestradiol B.B. (Large Dose)		Androsterone			
				Alone	+Thyroid Hormone (Large Dose)	Alone	+Thyroid Hormone (Large Dose)	Alone	+Oestradiol B.B. (Medium Dose)	+Thyroid Hormone (Large Dose)	+Thyroid Hormone (Large Dose) +Oestradiol. B.B. (Medium Dose)
Uterus	419	31	31	241	279	313	403	33	239	33	314
Vagina	304	164	175	289	324	297	348	214	353	216	370
Adrenals	61	55	86	84	135	70	104	42	62	70	123
Thyroid	15	14	14	16	15	17	17	15	15	16	17
Number of Rats in each Group	11	7	7	6	6	4	4	6	3	6	6

TABLE 3. EFFECT OF ANDROGENIC, OESTROGENIC AND THYROID HORMONES AMDINISTERED SEPARATELY OR SIMULTANEOUSLY ON MEDULLA AND CORTICAL ZONES OF ADRENAL AS MEASURED BY WEIGHT OF PAPER REPLICAS

Groups of Rats and Dose of Hormone	Weight of Average Paper Replica									
	Actual Weight (mg.)					As Percentage of total Wt. of Medulla and Cortex				
	Medulla	Glomerulosa	Fasciculata	Reticularis	Cortex	Medulla	Glomerulosa	Fasciculata	Reticularis	Cortex
1. Normal Controls	33	14	101	81	196	14.4	6.1	44.1	35.4	85.6
2. Ovariectomised controls	35	15	103	64	182	16.1	6.9	47.5	29.5	83.9
3. Thyroid hormone small dose	42	14	145	75	234	15.2	5.1	52.5	27.2	84.8
4. Thyroid hormone large dose	44	13	167	131	311	12.4	3.7	47.0	36.9	87.6
5. Oestradiol B.B. small dose	39	15	118	79	212	15.5	6.0	47.0	31.5	84.5
6. Oestradiol B.B. medium dose	47	13	136	118	267	15.0	4.1	43.3	37.6	85.0
7. Oestradiol B.B. small dose +thyroid hormone small dose	49	12	170	95	277	15.0	3.7	52.1	29.1	85.0
8. Oestradiol B.B. medium dose +thyroid hormone large dose	49	10	233	188	431	10.2	2.1	48.5	39.2	89.8
9. Oestradiol B.B. large dose	45	10	156	106	272	14.2	3.2	49.2	33.4	85.8
10. Oestradiol B.B. large dose +thyroid hormone small dose	40	7	195	104	306	11.6	2.0	56.4	30.1	88.4
11. Oestradiol B.B. large dose +thyroid hormone large dose	59	7	199	139	345	14.6	1.7	49.3	34.4	85.4
12. Androsterone	37	16	99	53	168	18.0	7.8	48.3	25.9	82.0
13. Androsterone +thyroid hormone small dose	42	15	129	64	208	16.8	6.0	51.6	25.6	83.2
14. Androsterone +thyroid hormone large dose	35	15	141	107	263	11.7	5.0	47.3	35.9	88.3
15. Androsterone +oestradiol B.B. medium dose	43	10	105	90	205	17.3	4.0	42.3	36.3	82.7
16. Androsterone +thyroid hormone and oestradiol B.B. small doses	46	12	143	94	249	15.6	4.1	48.5	31.9	84.4
17. Androsterone +thyroid hormone large dose +oestradiol B.B. medium dose	59	12	224	182	418	12.4	2.5	47.0	38.2	87.6

of the adrenal confirmed those given in this paper, in which these changes have been estimated from photomicrographs only. In the photomicrographs made from the adrenals stained by sudan black for fatty substances, both adrenal capsule and in some cases z. glomerulosa were only faintly outlined, because in these cases the glomerulosa cells did not contain any lipoid granules. Therefore the borderline between capsule and z. glomerulosa has been drawn on the photomicrographs with india ink.

For statistical analysis Fisher's "t" test was used, and the values of experimental or normal groups were compared with the group of control ovariectomised rats, unless otherwise stated.

Effect on Uterus

Ovariectomy and Oestrogens.—Previous investigations, including those of Korenchevsky and associates, have established the fact that ovariectomy produces atrophy of all uterine tissues while oestrogens restore their histologic structure towards the normal condition.

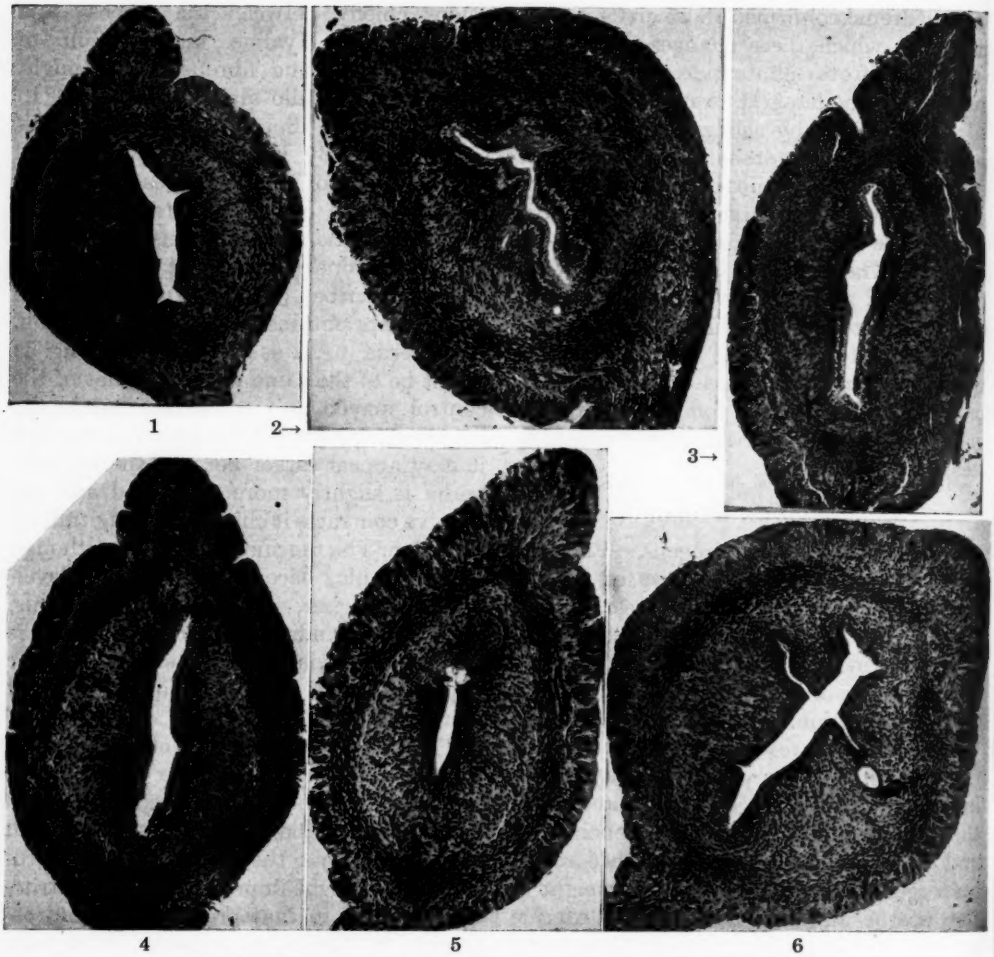
There are, however, some differences in the structure of the uterus of spayed rats injected with oestrogens compared with that of normal rats. Thus, Korenchevsky and Hall (39) recorded that with doses of oestrogens, bringing the size and weight of the uterus towards normal, the uterine mucosa is less cellular and more fibrous and contains fewer glands, the epithelium becomes abnormally high and, when distension of the horns is present, acquires a "tumbler-like" appearance with occasional vacuolation. With prolonged injections or higher doses, more pronounced pathologic changes appear—squamous metaplasia of uterine epithelium and glands, desquamation of keratinised epithelium into the uterine lumen (which might completely close the lumen and greatly distend the horns), subepithelial oedema and, in some cases, pyometra. Fibrosis (McEuan, Selye, and Collip) might reach such a degree that horns become nearly solid, pearly white and hard. This hypertrophic fibrosis develops chiefly between the mucosa and myometrium. Hyaline degeneration of some muscular and fibrous tissues might also occur (Castillo and Sammartino). In addition to the illustrations given in previous papers by Korenchevsky and Hall (38, 39) some of these changes are clearly seen in figure 8 (as compared with the structure of the normal uterus in fig. 7).

Androsterone.—This effect has been previously described (34, 37, 39) and the same results were obtained in this investigation. The uterus (fig. 2 as compared with fig. 1) might be of the same weight as that of the control spayed uninjected rats but in the transverse section of the photomicrograph it may appear larger because the myometrium is slightly more developed and the fixative contracts it chiefly in a longitudinal direction. The uterine epithelium, although still atrophic, becomes also better developed and higher, with larger nuclei. Thus, the effect of androsterone on the uterus is slight and consists of a slightly better development of uterine myometrium and epithelium and their nuclei.

Thyroid Hormone.—The effects on uterus of spayed rats has, as far as we know, not been previously described. Figures 3 (large dose of the hormone) and 4 (small dose) show that the uterus remains atrophic, but a slight improvement in its structure, similar to that produced by androsterone, is noticeable, namely, a slightly higher epithelium and slightly better developed myometrium cells. The nuclei of the latter and in most cases also of the epithelium become slightly larger.

Combined Action of Androsterone and Thyroid Hormone.—The combined action of androsterone and thyroid hormone (fig. 5—androsterone and thyroid small dose—and fig. 6—androsterone and thyroid large dose) shows no cumulative effect.

Combined Action of Androsterone and Oestrogens.—This has been described in previous papers (37, 39). The results of the present investigation confirm the previous conclusion, namely, that although apparently more normal development of the



HORN OF UTERUS, transverse section. Haematoxylin+Eosin, ×77.

FIG. 1. Ovariectomised control rat. Atrophic uterus, 30 mg.

FIG. 2. Ovariectomised rat injected with androsterone. Atrophic uterus (33 mg.), but with definitely better developed epithelium and slightly better myometrium.

FIG. 3. Ovariectomised rats receiving large dose of desiccated thyroid. Atrophic uterus (27 mg.), but with epithelium higher than in control rats and slightly larger nuclei in myometrium.

FIG. 4. Ovariectomised rat receiving small dose of desiccated thyroid. The same change as in fig. 3. Uterus 40 mg.

FIG. 5. Ovariectomised rat receiving androsterone and small dose of desiccated thyroid. Atrophic uterus (36 mg.), with changes as in figs. 3 and 4.

FIG. 6. Ovariectomised rat receiving androsterone and large dose of desiccated thyroid. Atrophic uterus (37 mg.), with changes as in fig. 5.

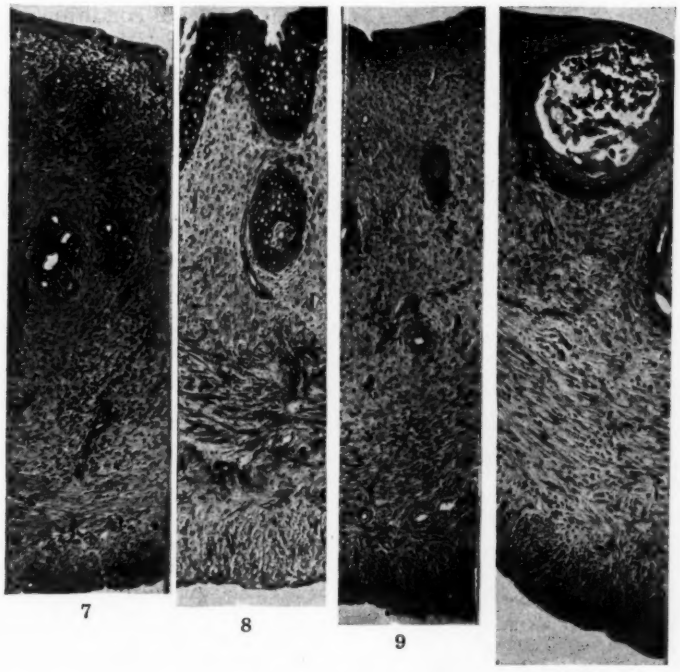
structure of the mucosa and especially of the myometrium results after these combined injections, the uterine epithelium remains typically "oestrogenic," consisting of abnormally high columnar cells often with squamous metaplastic changes. In the present experiment, with the dose of androsterone used, this metaplasia was found in approximately the same percentage, after combined injections, as in the uteri

of rats injected with oestradiol alone (fig. 8).

Combined Action of Oestradiol and Thyroid Hormone without or with Androsterone. (fig. 9)—This results in a histologic structure of the uterus which does not differ significantly from that produced by the combined injections of androsterone and oestrogens. As compared, however, with the effect produced by oestradiol alone, the uterus becomes slightly larger, and the mucosa and myometrium appear to be somewhat better developed.

At the same time, especially after injections of all three hormones (fig. 9), the uterine tissues acquire a more regular structure, similar to that in normal control animals (fig. 7). The epithelium, however, remains typically "oestrogenic," i. e. abnormally high, and might undergo the same metaplastic changes (fig. 10) as with oestradiol alone.

Thus, the combined administration of all three hormones appears to produce the best effect in returning this organ towards the normal structure. The development of metaplasia, however, indicates that the combination of the hormones used is not complete in attaining normal structure and not the best one.



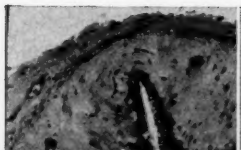
7 8 9 10

FIG. 7. Normal intact control rat. Part of wall of uterine horn. Weight of uterus 373 mg. Well developed mucosa, myometrium, and glands. ×77

FIG. 8. Ovariectomised rat injected with medium dose of oestradiol B. B. As compared with fig. 7, mucosa is more fibrous, circular myometrium more irregular, and epithelium and glands in a pathologic state of squamous metaplasia. Weight of uterus 305 mg.

FIG. 9. Ovariectomised rat simultaneously treated with androsterone, medium dose of oestradiol B. B. and desiccated thyroid. The histologic structure does not differ significantly from the normal one except by an abnormally high oestrogenic epithelium and one gland (in the upper third of the photograph) in a mild state of metaplasia. Uterus 334 mg.

FIG. 10. Ovariectomised rat treated with medium dose of oestradiol B. B. and large dose of desiccated thyroid. Severe metaplasia and cystic dilatation of uterine glands. Uterus 347 mg.



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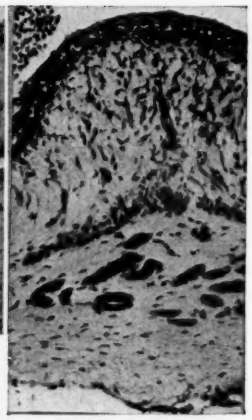

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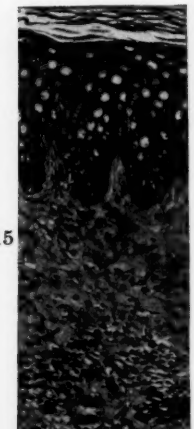

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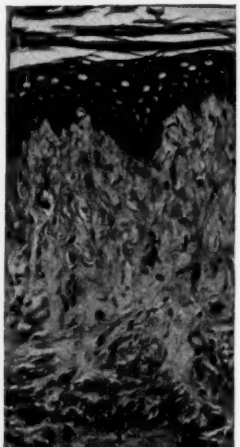

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PART OF VAGINAL WALL, transverse section, ×123. Haemotoxylin+Eosin. All rats are ovariectomised.

This confirms the results previously obtained by Korenchevsky and Hall (39), and our latest data (so far unpublished) which demonstrate that, in order to prevent the pathologic changes in uterine epithelium produced by oestrogenic and androgenic hormones (squamous metaplasia and adenoma-like changes), at least one more hormone is needed, namely progesterone.

Effect on Vagina

Ovariectomy and Oestrogens.—As in the case of the uterus, it is well-established that ovariectomy produces atrophy of all tissues in the vagina (fig. 11), while oestradiol in suitable doses returns this organ to a nearly normal condition (fig. 15).

Androsterone Alone or in Combination with Oestrogens.—This has been previously described (34, 37, 39). The results of the present experiments confirm the previous conclusions, namely, that androsterone, when injected alone, produces a better, although not completely normal, structure of all tissues in the vagina (fig. 12). This improvement explains the larger size and weight of the vagina. The vaginal epithelium, although it contains a greater number of rows (3 to 4) of cells than the control spayed rats (fig. 11), is still atrophic.

Fig. 11. Control rat. Atrophic vagina, 166 mg.

Fig. 12. Androsterone injections. Although atrophic, vagina is better developed (264 mg.), with higher epithelium, wider and more cellular mucosa and muscular layer.

Fig. 13. Treatment with large dose of thyroid. Vagina (180 mg.) has 3–4 rows of epithelial cells (as compared with two rows in control rats) and better developed muscular layer.

Fig. 14. Treatment with androsterone and large dose of thyroid. As compared with fig. 11, vagina (260 mg.) has considerably better developed mucosa and muscular layer, 3 to 4 rows of epithelium, the upper row being columnar.

Fig. 15. Injections of medium dose of oestradiol B. B. Vagina (293 mg.) is nearly normal, with oestrus cornification of the upper epithelium.

Fig. 16. Treatment with oestradiol B. B., androsterone, and large dose of thyroid. The thicker better-developed wall is the only difference between this vagina (375 mg.) and that in fig. 15.

Androsterone with Oestradiol.—This produces a normal or even slightly larger size and a normal histologic structure of the vagina. Usually the effect of the oestradiol prevails and therefore the vaginal epithelium shows oestrus-like cornification and desquamation.

Thyroid Hormone.—In the present experiments, thyroid hormone, when alone, produced only a slight effect, in most cases recognisable in a slightly better development of the mucosa with somewhat enlarged, and in places low columnar epithelial cells and in a more cellular submucosa and muscularis (fig. 13). In the literature there are only data indicating that in normal rats nontoxic doses of thyroid hormone produce progestational changes in the ovaries as indicated by increased number and enlarged corpora lutea (Hayashi; Weichert and Boyd) and also in the vagina as shown by mucification of the epithelium (Weichert and Boyd). This progestational effect of thyroid hormone which was definitely seen in normal rats, and which we found to be only slight (a tendency of the epithelium to become columnar in spayed rats) should apparently explain the results of experiments performed by Reiss and Fereny (52), Horn (28), and Meyer and Wertz (47). These workers noticed that in ovariectomised rats, in which a hyperthyroid condition had been experimentally produced, larger amounts of oestrogens are necessary in order to produce oestrus. Thus, these observations, taken together with our present results, show that thyroid hormone exerts an anti-oestrus effect (i. e. an antagonistic relation exists between thyroid and oestrogenic hormones in producing oestrus), simultaneously with a cooperative action of these hormones which produces progestational-like development of ovaries and vagina.

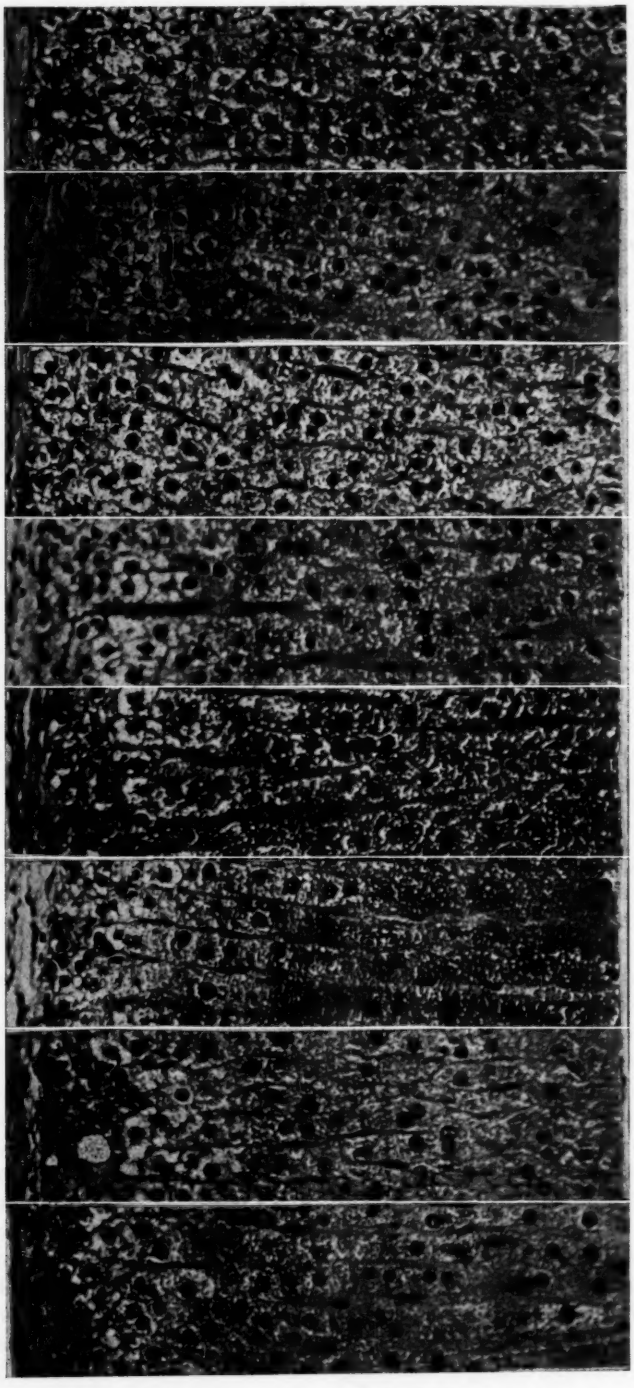
Thyroid Hormone Together with Oestradiol.—After administration of thyroid hormone together with oestradiol, the structure of the vagina was still typical of oestrus, and no definite changes, differing from those obtained with oestradiol alone, could be observed. Perhaps, however, a slightly better development of vaginal muscularis, present in some cases, should be recorded. Thus, in the doses used, the oestradiol effect overcame that of thyroid hormone.

Androsterone and Thyroid Hormone Combined.—This combination has been studied in the present experiments only. A better development of all vaginal tissues was obtained. An intensification of the progestational-like changes in the vaginal epithelium was recorded (fig. 14) as compared with the changes obtained with androsterone alone (fig. 12) or thyroid hormone alone (fig. 13), namely, the columnar epithelial cells were higher and contained more mucin. The cells, however, were still of the atrophic type and much less developed and mucified as compared with vaginal epithelium during pregnancy or after combined injections of oestrogens and progesterone (38, figs. 2, 5, 6, and 33).

Androsterone, Thyroid Hormone and Oestradiol Administered Simultaneously.—This produced a vagina of normal oestrus structure (fig. 16), which was similar histologically to that of rats treated with the two hormones only, androsterone and oestradiol. In this combination the oestrogenic effect (keratinisation of vaginal epithelium) also predominated, as it did in the other combinations containing oestradiol in the doses used. The size of vagina, however, was greatest when all three hormones were administered, in most cases being even slightly greater than in normal control rats.

Effect on Adrenals

Ovariectomy and Oestrogens.—In previous reviews of the literature (Tepperman, Engel, and Long; Korenchevsky and Jones) it has been recorded that contradictory results relating to the changes in weight of adrenals of female rats have been obtained after ovariectomy. Tepperman, Engel, and Long emphasized that, while an initial hypertrophy could be observed in adrenals of spayed rats, a decrease in size and weight of these glands was found by the majority of workers when a longer time had elapsed after ovariectomy. Korenchevsky and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Jones (42) showed in their own experiments and by recalculation of data from other investigations, that this hypoplasia becomes obvious if the relative weights of the adrenals are examined.

Histologically the following changes have been found. A decrease of one or all three cortical zones (7, 23), decreased size of the fasciculata cells (7), of the reticularis cells (7, 23), degenerative changes in reticularis cells (1, 7, 23), hyperaemia of reticularis (7, 23) and a decreased number of lipoid granules (1, 14), or no changes (23), or an increase in their number (45, 57). In contrast to these observations, Bourne and Zuckerman (8) have described a larger cortex and a "swelling" of the cells in spayed rats. Matsuyama mentions presence of small sized cells with pycnotic nuclei in the medulla. In the present experiments, in agreement with an insignificant decrease in weight of the adrenals, ovariectomy did not produce significant changes in actual relative size of adrenal zones. In the z. reticularis (fig. 26) hyperaemia was present and some hypoplasia of cells, but no changes in content of lipoid granules.

Thus, these results are in accordance with those of the majority of the previous investigators.

Previous workers have recorded that, in female ovariectomised rats, oestrogens produced enlargement of the cortex (Selye, Collip, and Thomson; McEuen, Selye, and Collip; Ellison and Burch; Castillo and Sammartino; Silvestroni; Hamm, Hammel, Rardin, and Schoene; Morrell and Hart; Bourne and Zuckerman; Pinto) but the glomerulosa in some cases may be narrower (Castillo and Sammartino; Hall).

The size of the cells was measured only by Bourne and Zuckerman (8) and found to be greater, more constantly, in the z. fasciculata, but Ellison and Burch (15) and Castillo and Sammartino (11) have also mentioned the larger size of the fasciculata cells. Other changes consist in hyperaemia chiefly of the z. reticularis (6, 57, 23, 8, 22), formation of blood lacunae in cortex (22) and, with large doses of oestrogens, haemorrhages and cysts (8, 46); or adenomas (11, 46). Degenerative and hypoplastic changes in the z. reticularis are definitely increased, being greater as the doses of oestrogens become greater (23, 49). The number of lipoid granules was recorded as decreased (22, 23, 56), or increased (57). Grumbrecht and Loeser (21) found depletion of lipoid granules even after oral administration of oestradiol (to intact female rats). With a very small dose of oestrone (0.5γ daily, total 18γ) Montpellier and Chiapponi (48) observed no changes in the adrenals of normal and gonadectomised rats.

In the present experiments, oestradiol

PART OF OUTER REGION OF ADRENAL CORTEX, transverse section, ×310. Haematoxylin+Eosin. Ovariectomised rats.

FIG. 17. Control rat. Adrenals 70 mg. In this photomicrograph (and in the following ones) can be seen from right to left—1) fibrous capsule, 2) z. glomerulosa, of varying width in different rats, with irregular cell and nuclei disposition, 3) upper part of z. fasciculata with regular cords of cells.

FIG. 18. Androsterone injections. Slightly decreased size of the cells in z. fasciculata. Adrenals 54 mg.

FIGS. 19–20. Treatment with small dose (fig. 19) and large dose (fig. 20) of desiccated thyroid. Z. glomerulosa is narrower and with smaller cells after treatment with the large dose. With both doses the fasciculata cells are larger; and with the large dose large nuclei also occur frequently. Adrenals 69 and 110 mg. respectively.

FIG. 21. Treatment with androsterone and a large dose of thyroid. Z. glomerulosa is narrower with smaller cells, fasciculata cells are larger. Adrenals 88 mg.

FIG. 22. Injections of oestradiol B. B. Z. glomerulosa narrower with small cells. Fasciculata cells enlarged and some nuclei are larger. Adrenals 108 mg.

FIG. 23. Treatment with oestradiol B. B. and large dose of thyroid. Changes as in fig. 22. Adrenals 171 mg.

FIG. 24. Treatment with oestradiol B. B., large dose of thyroid and androsterone. Changes as in fig. 23. Adrenals 160 mg.

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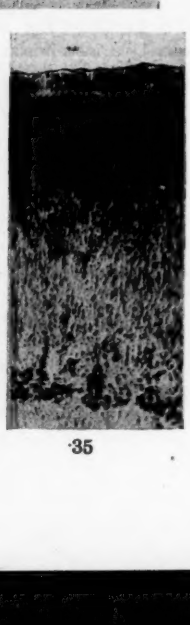

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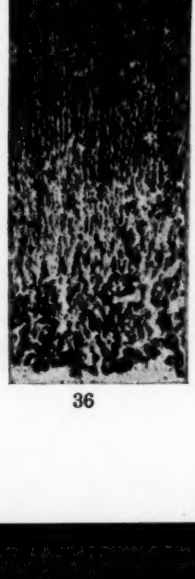

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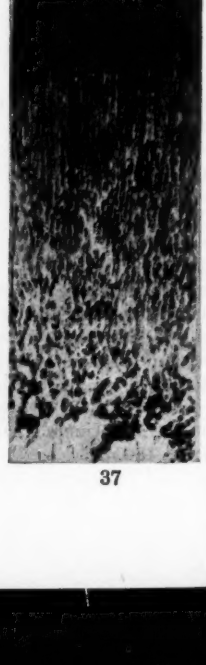

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B. B. produced an enlargement of the cortex with all doses (table 3, lines 5, 6, and 9), statistically significant, however, only for medium and large doses ($P < .01$-$.001$). In this enlargement the zones affected were the z. fasciculata and reticularis, but not the z. gomerulosa. The latter, with medium and especially large doses of the hormone, became smaller (table 3, lines 6 and 9, figs. 22, 27, and 28). The size of the fasciculata cells appeared to be larger (fig. 22). Lipoid granules were depleted with the z. glomerulosa with medium or large doses of oestradiol, and with a large dose some depletion was noted also in the z. reticularis (figs. 27 and 28). With a small dose of oestradiol a normal content of lipoid granules may be present in all zones. Hyperaemia and slight to moderate atrophic and degenerative changes were present in the z. reticularis, these changes being more pronounced with large doses (fig. 28).

Thyroid Hormone.—The detailed histology of adrenals of female rats after thyroid hormone administration has not been studied previously in detail. Hashimoto (25) only mentioned that congestion and picnotic nuclei were observed in some of his experiments. Sciaky (53) also found irregular or no changes. In the present experiments the enlargement of the adrenals produced by administration of desiccated thyroid is explained by enlargement of the cortex ($P < .05$-$.02$, table 3, lines 3 and 4,

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ADRENAL CORTEX, transverse section, ×55. Lipoids stained with sudan black. Borderline between unstained or very faintly stained adrenal capsule and z. glomerulosa, in some cases also unstained, is drawn on photographs with india ink. Below z. glomerulosa—cords of z. fasciculata, under the latter the net of z. reticularis, and under the latter a small part of medulla (unstained). All sections are from ovariectomised animals except that in Fig. 25.

FIG. 25. Control normal intact rat. All three zones well impregnated with black lipoid granules. Adrenals 65 mg.

FIG. 26. Control ovariectomised rat. As compared with fig. 1, hyperaemia and some hypoplasia of cell cords in z. reticularis are seen. Adrenals 60 mg.

FIG. 27. Injections of medium dose of oestradiol B. B. As compared with fig. 26, a narrower z. glomerulosa depleted of lipoid, but slightly increased z. fasiculata and reticularis well impregnated with lipoid granules were present. Hyperaemia of the latter zone. Adrenals 108 mg.

FIG. 28. Large dose of oestradiol B. B. Similar but more pronounced changes than in fig. 27. Some lipoid depletion in the reticularis cords, which are hypoplastic. Adrenals 83 mg.

FIG. 29. Small dose of desiccated thyroid. All cortical zones well impregnated with lipoid, normal width of z. glomerulosa, but slightly enlarged fasiculata and reticularis zones, with some hyperaemia in the latter. Adrenals 69 mg.

FIG. 30. Large dose of thyroid. Enlarged zones. Fasciculata with normal lipoid content except in the lower part, and reticularis with hyperaemia and decreased lipoid granulation in the upper part. Adrenals 100 mg.

FIG. 31. Medium dose of oestradiol B. B. and large dose of thyroid. Z. granulosa narrowed and depleted of lipoid; much enlarged fasciculata and a less enlarged reticularis, both with normal lipoid granulation. Adrenals 165 mg.

FIG. 32. Androsterone. All three zones smaller and partially depleted of lipoid. In contrast to oestradiol effect, no hyperaemia or hypoplasia of cords is present in z. reticularis. Adrenals 34 mg.

FIG. 33. Androsterone + medium dose of oestradiol B. B. As compared with androsterone effect or oestradiol effect, the simultaneous administration resulted in a return towards normal structure of the zones and their lipoid content. Adrenals 65 mg.

FIG. 34. Androsterone and small dose of thyroid. Normal structure of adrenals (48 mg.).

FIG. 35. Androsterone and large dose of thyroid. The large dose of the latter hormone is followed by appearance of the changes typical for this dose (fig. 30)—namely, hyperaemia and decreased lipoid impregnation in z. reticularis and lower part of fasciculata. Adrenals 76 mg.

FIG. 36. Androsterone, oestradiol B. B. and small dose of thyroid. Z. granulosa narrower and depleted of lipoid, fasciculata and reticularis zones enlarged, with normal lipoid content. Some hyperaemia in the lower part of cortex. Adrenals 88 mg.

FIG. 37. Androsterone, oestradiol B. B. and large dose of thyroid. Similar changes, but the fasiculata and reticularis zones are more enlarged, and hyperaemia more pronounced. Adrenals 160 mg.

figs. 29 and 30). The fasciculata and reticularis zones only, however, were involved in this hypertrophy, the z. glomerulosa being unchanged with the small dose or slightly decreased with a large dose. Enlargement of the medulla was slight and statistically not significant.

The fasciculata cells appear to be enlarged, as figures 19 and 20 indicate. The large dose appears to produce also large nuclei (fig. 20), i.e. an effect similar to that which we have previously (31) described in the renal and liver cells of these rats, or (40, 41) normal rats. Taking into consideration the vital importance of the nucleus in the cell, simultaneous hypertrophy both of nucleus and cytoplasm must be emphasised as a favourable feature of the cell stimulation by thyroid hormone. Hyperaemia of the z. reticularis was present in nearly all cases, but a decreased number of lipoid granules, especially with large doses, was observed in some cases only and chiefly in the z. reticularis (fig. 30).

On the whole, the adrenals of this group produce an impression of an active and considerably stimulated gland.

Combined Administration of Thyroid Hormone and Oestradiol—This produced very large adrenals, due chiefly to a great increase of cortex ($P < .001$) and to only a slight increase of medulla ($P < .05$-$.01$) both with small (table 3, line 7) and large (lines 8 and 11) doses.

The fasciculata and reticularis zones were hypertrophied, but the glomerulosa, on the contrary, was considerably decreased. Obviously, the latter effect was due chiefly to oestradiol, but not exclusively, since each of the two hormones given separately produced a similar but lesser effect (table 3). These changes were reflected also in the relative proportion in size of different parts of the adrenals (table 3, columns 6 to 10). This relationship, however, in spite of the great hypertrophy of adrenals was comparatively little disturbed. The size of the cells of the z. glomerulosa was decreased, but that of the fasciculata cells and of the reticularis cells was increased (fig. 23), while the number of large nuclei in the fasciculata cells was also increased.

Depletion of lipoid granules was observed in the z. glomerulosa with all doses (fig. 31) and, in some cases, in the upper part of the z. reticularis. Such a depletion is typical of oestrogenic action.

Hyperaemia and hypoplastic changes of the z. reticularis, which are also typical of oestrogenic effect, were present. In some cases these changes and lipoid depletion in this zone were not greater (due to an expected cumulative effect), but, on the contrary, less pronounced (fig. 31) than with oestradiol alone (figs. 27 and 28) or (lipoid depletion) with thyroid alone (fig. 30).

Islets of "reticularis boundary" cells were often present (fig. 31) at the bottom of the cortex. They have been described also by Hall (23).

Stimulated adrenals of this group, except for pronounced hypertrophy, deviated comparatively little from the normal structure.

Androsterone.—In Hall's experiments (23) androsterone slightly decreased the width of the fasciculata and reticularis zones in the adrenals but not of the z. glomerulosa, and produced a depletion, usually only a slight one, of lipoid granules in the two former zones. The same changes in width of the zones, but lesser in degree and statistically not significant, were observed in the present experiments (table 3, line 12). As in the previous experiments on male rats (Hall and Korenchevsky) the size of the fasciculata cells appears to be slightly smaller (fig. 18). Figure 32 represents one of the adrenals with a larger depletion of lipoid granules in all three zones, whereas in some other glands this depletion was considerably less pronounced. The hyperaemia and degenerative changes in the z. reticularis recorded in the control ovariectomised rats, were not present in this group.

Androsterone Injected Simultaneously with Oestradiol—In the experiments of Hall (23) this partially prevented the de-

generative and destructive changes produced in adrenals by oestradiol, but the lipoid depletion still persisted. On the whole, the present experiments (table 3, line 15) confirm this observation, but the preventative action of androsterone was found to be very marked in reducing some oestradiol effects. Thus, although the glomerulosa was decreased (oestrogenic effect) the lipoid depletion was absent (fig. 33), except in one case in which the lipoid granules were reduced in the z. glomerulosa. On the other hand, oestradiol counterbalanced the hypoplastic properties of androsterone by increasing the weight of the adrenal, the width of the cortex and the size of the cells. Hence, by simultaneous injection of these two hormones, a more normal structure of adrenals was obtained.

Simultaneous Administration of Androsterone and Thyroid Hormone.—This was also able to prevent the hypoplastic action of androsterone, returning the weight of the gland, the width of the zones, and the size of the cells towards normal with a small dose of thyroid hormone (table 3, line 13, figs. 21 and 34) ; and up to or above normal with the large dose (table 3, line 14, and fig. 35). Depletion of lipoid granules was absent with the small dose of thyroid hormone, the glands in this group showing more or less normal structure (fig. 34). When androsterone was injected with a large dose of thyroid hormone (fig. 35), the lipoid depletion in the z. reticularis was similar to that observed with the large dose of thyroid hormone alone (fig. 30).

Simultaneous Administration of all Three Hormones (table 3, lines 16 and 17) —This produced hypertrophy of the adrenals, due chiefly to enlargement of the cortex ($P < .01$-$.001$) and, to a lesser degree, of the medulla ($P < .05$-$.001$): The fasciculata cells seem to be slightly enlarged (fig. 24), but the width of the cortex was about the same as that in rats receiving simultaneously the respective doses of oestradiol and thyroid hormone only (lines 7 and 8). The normal abundance of lipoid granules in the cells of the fasciculata and reticularis zones and the comparatively regular bands of the cells in these zones (figs. 36 and 37) were similar to those in normal control rats (fig. 25). The z. glomerulosa, however, was depleted of lipoid granules ("oestrogenic" effect).

The relative proportion in size of different zones and medulla (table 3, columns 6 to 10) was also close to that of normal control rats, especially when a small dose of thyroid hormone was used in this combination of the three hormones (line 16).

General Remarks.—Some general remarks can be made with reference to the adrenals in all groups. The number of mitoses was investigated, but was found to be very small and variable in all groups.

The relative proportion in size of different parts of the adrenals (table 3, columns 6 to 10) in different groups, in spite of great changes in their size and weight, was remarkably close to the normal one, especially when the cortex was taken as a whole. The biggest range of variations was observed in the z. glomerulosa which, being the smallest part of the adrenal, influenced very little the relationship in size of the other parts of the adrenals and especially of the cortex taken as a whole.

Effect on Thyroid

Ovariectomy and Oestrogens.—After ovariectomy in rats histologic evidence of hypofunctioning of the thyroid (flattened epithelium and accumulation of hard eosinophilic colloid) was obtained by Matsuyama (45), Demel, Jatrou, and Walner (14), Benazzi (3), Anderson and Kennedy (1), and by Emge and Laqueur (16). No change was found by Bialet-Laprida (5).

Schultze (54, 55) confirmed the observation of those authors who found that after ovariectomy there might be normal fat deposition or the rats might become obese. Therefore he, like Korenchevsky (33), defines his animals as "fat" or "thin" castrates as the case might be. In his own experiments Schultze observed that about six weeks after castration, both fat and thin castrates had a depressed thyroid with

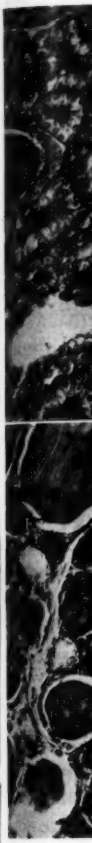
characteristic histologic changes. Three or four months after ovariectomy, however, in fat castrates the thyroid still showed the histologic features of depression, while in thin castrates the structure of the thyroid had returned to normal. Schultze, however, doubts whether the hypofunction of the thyroid after gonadectomy is the real cause of castration obesity, because six weeks after ovariectomy not only fat, but also thin castrates had depressed thyroids. In his opinion basophilia of the anterior lobe of the hypophysis is the main cause of castration obesity, because in fat castrated rats the number of basophilic cells was considerably increased as compared with that in thin castrates.

Oestrogens, according to the majority of investigators, produce hypofunction of the thyroid both in normal female and in ovariectomised rats (5, 4, 27, 21, 43, 11, 2, 44, 16, 49). In some of their animals Morrell and Hart (49) noticed destruction of walls in some of the thyroid follicles, and coalescence of their colloid into one mass, sometimes with ensuing hyalinisation or fibrosis. Another indication of the antithyroidal effect of oestrogens is demonstrated in the storage and metabolism of glycogen in the liver. Zain (61) found that the loss of glycogen in the liver, produced by thyroid hormone, could be prevented by a preliminary administration of oestrogens. Janes and Nelson (29) and Griffiths, Marks and Young (20) also found that oestrogens increase storage of glycogen in the liver, which in its turn is at least partially responsible for an increase in the weight of the oestrogenic liver.

Some workers, however, noticed no effect of oestrogens on the histologic structure of the thyroid in normal and ovariectomised rats (Montpellier and Chiapponi; Ellison and Burch; and in some experiments of Heyl, De Yongh, and Kooy; and Haam, Hammel, Rardin, and Schoene). This contradiction was explained by the observation that only large doses or prolonged administration of oestrogens is followed by depression of the thyroid, while small doses or short periods of injections might produce no effect, or even (DeAmilibia, Mendizabal, and Bottella-Llusia, working on male rats) a stimulation of the thyroid. In the latest experiments of Zondek (62, 63) most symptoms of Graves' disease were induced in female rats and rabbits, but only in a small percentage of animals treated with oestrogens for a long period (for example only in 3 out of 100 rats treated with 500 to 2000γ of oestradiol benzoate twice a week for about seven months). Moreover, when the animals were killed, one month after disappearance of these thyrotoxic symptoms, their thyroids did not present a picture typical of Graves' disease.

Taking into consideration that with oestrogen treatment a depression of thyroid activity was obtained by the majority of investigators not only in rats but in other experimental animals (guinea pigs and rabbits), some clinicians tried to use oestrogens for therapeutical purposes in cases of human Graves' disease or other forms of thyrotoxicosis. They were encouraged by the observations of Jonas and Markalous (30), who obtained in cases of Graves' disease abnormally low figures for oestrogen excretion in the urine. Varying results have been obtained with this treatment: while some authors such as Goldman, Goldman, and Kurzrok; Goldman, Schaffer, and Markham; and Starr and Patten) observed an improvement in the disease; others, for example Farbman (17), were unable to obtain definite effects.

Thyroid Hormone.—The effect of thyroid hormone on the histology of the thyroid gland has been previously studied, not on spayed rats but on normal female rats (Cameron and Carmichael; and Korenchevsky, Hall, and Clapham), and also on male rats and on other laboratory animals (for example by Kojima and Courrier). In all experiments the hormone produced depressed functioning of the thyroid gland as shown by flattening of the epithelial cells and nuclei and increased accumulation of condensed, strongly eosinophilic colloid, which in some cases has exuded from the



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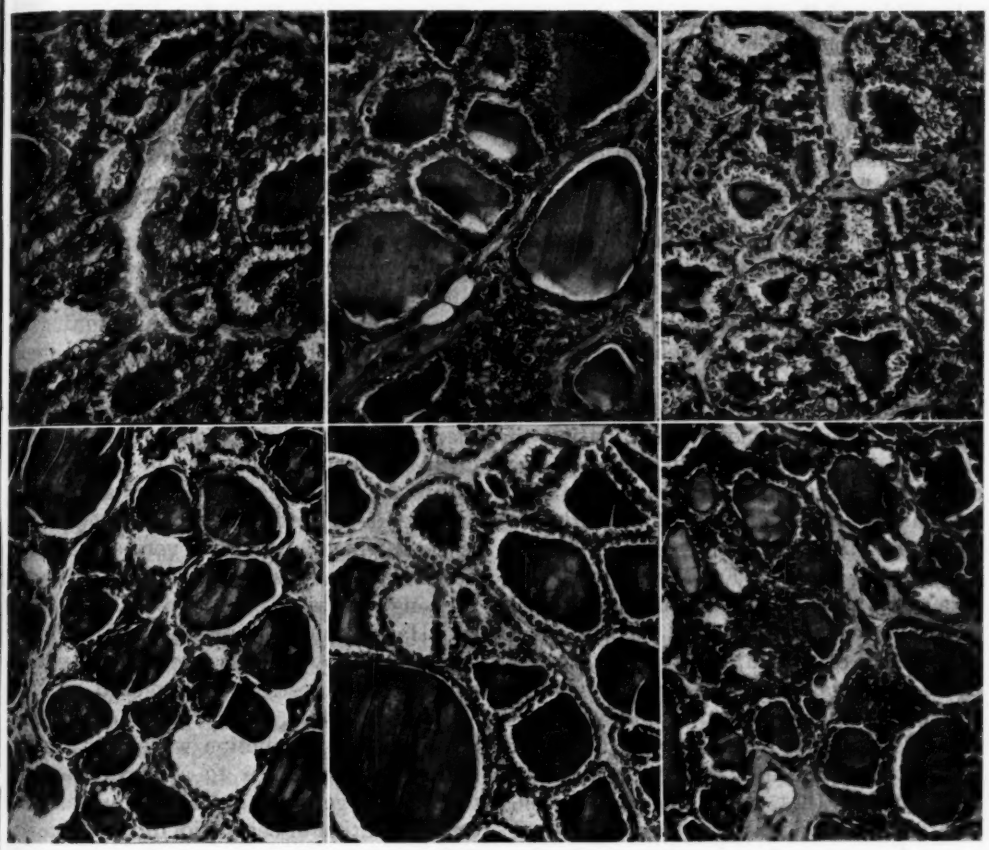

THYROID ×180. Haematoxylin + Eosin.

FIG. 38. Normal intact control rat. Moderately active thyroid (weight 16 mg.).

FIG. 39. Ovariectomised control rat. Lower epithelium and accumulation of larger amount of colloid in follicles suggest lowered activity of the thyroid (19 mg.), colloid accumulation being probably responsible for higher weights.

FIG. 40. Androsterone injected ovariectomised rat. As compared with fig. 39, height of epithelium returned to or slightly above normal and the amount of colloid decreased—both effects indicating stimulating action of androsterone. Weight of thyroid 14 mg.

FIG. 41. Ovariectomised rat treated with large dose of desiccated thyroid. Very low flattened epithelium and large amount of hard colloid indicate depressed activity of thyroid (16 mg.)

FIG. 42. Ovariectomised rat treated with large dose of desiccated thyroid and androsterone. In this case a slight increase of epithelium size might suggest a weak neutralising effect of androsterone, the strong depressing effect of thyroid hormone predominating. Weight of thyroid 19 mg.

FIG. 43. Ovariectomised rat treated with medium dose of oestradiol B. B. and large dose of desiccated thyroid. Effect similar to that in fig. 42. Weight of thyroid 15 mg.

follicles and distended the lymphatic vessels and interfollicular spaces.

Androsterone.—The effect of androsterone, alone or in combination with oestrogens, or thyroid, or with both of the two latter hormones on the histologic structure of the thyroid has not been investigated by previous workers. Carriere, Morel, and Gineste (10) and Nathanson, Brues, and Rawson (50), however, observed that testosterone propionate stimulated thyroids of rats, producing an increased number of mitoses, a higher epithelium with larger rounded nuclei, and vacuolated, lightly-stained colloid.

In the present experiments (as in the previous ones) histologic examination of thyroids in rats proved difficult because of the varying histologic structure of different parts of the same gland. In order to overcome this difficulty, the following scheme was adopted. For tabulation, symbols were used to denote the height and form of the epithelium and quantity and appearance of colloid, such as very active (v.a.), moderately active (m.a.), slightly active (a.), depressed (d.), and very depressed (v.d.). For definition of a particular gland, the symbol describing the majority of follicles in that gland was placed first, and so on in descending order of their approximate number in the gland. For example, "m.a., a." denotes a gland (as the case was in most normal control rats, fig. 38) where the greater number of follicles were moderately active and the rest, still active but to a lesser degree. Similarly "a., m.a." means that the majority of follicles were slightly active and the minority moderately active. Depressed follicles were absent in nearly all the normal rats. As compared with the normal control group, the thyroids of most ovariectomised rats (fig. 39) were less active, the majority of the follicles denoted by "a." followed by "d." or "v.d." Follicles of the "m.a." type were few if any.

On an average the abdominal fat in control spayed rats in Experiment I weighed 13.2 gr., and 6.5 gr. in Experiment II. At the same time, histologic structure of the thyroid indicated a slightly greater hypofunctioning in the fatter rats of Experiment I (although none of the rats could be called obese) as compared with the thinner rats of Experiment II. This appears to confirm Schultze's previously mentioned statement, although more numerous observations are needed for a definite conclusion to be made.

Androsterone.—Androsterone slightly stimulated the thyroid of spayed rats, making their histologic structure similar to that of the normal intact control animals (fig. 40).

Oestradiol.—Oestradiol in the small, medium, or large doses used, did not produce any definite changes in our experiments. It is necessary to emphasize, however, that oestradiol benzoate-butyrate is an ester which is absorbed very slowly and produces chiefly stimulating and not depressing effects (Korenchevsky, Burbank, and Hall). Thus, our results confirm those experiments by previous workers, in which small doses of oestrogens were used.

Administration of thyroid hormone depressed thyroid function with both doses, small and large, but to a greater extent with the large dose (fig. 41). Simultaneous administration of oestradiol did not change definitely or constantly the effect produced by the thyroid hormone (fig. 43).

The stimulating properties, however, of androsterone were also indicated when this hormone was given together with a small dose of thyroid hormone—there was less depression. When oestradiol was added to this combination, the stimulating properties of androsterone became less evident. Also, in most cases, the stimulating properties of androsterone did not show, or at least were less pronounced, when this androgen was administered together with the large dose of thyroid hormone, alone or together with oestradiol, because the large dose of thyroid hormone was so much more powerful in its action that it predominated over the comparatively weaker androsterone effect (fig. 42). Although the number

of mitoses was counted in the thyroids, they were found, as in the adrenals, to be very rare and unchanging in number in all groups. Therefore no counts are given.

Thus, the present investigation confirms those previous observations in which it has been found that ovariectomy slightly depresses, and thyroid hormone much more strongly depresses the function of the thyroid. This latter effect is explained by the fact that, when a specific hormone is administered in sufficiently strong dose, it produces a depression in the gland secreting that particular hormone in order to adjust the reciprocal balance of hormones in the organism. Androsterone (as is the case with testosterone propionate) stimulates the thyroid, and oestrogens might produce no effect. The androsterone effect is, however, only slight, probably because this hormone is a much weaker androgen than testosterone.

At the same time, our observations indicate that, in order to avoid the depressing effects on the thyroid gland of treatment with thyroid hormone, administration of a small dose of thyroid hormone together with androgen appears to be the best combination (in females).

Summary

1. Histologic examination of uterus, vagina, adrenals, and thyroid in 119 female rats (11 normal and 108 ovariectomised) was made in order to study the effects of androsterone, oestradiol benzoate-butyrate, and thyroid hormone, alone or in various combinations, on the accelerated process of aging produced by ovariectomy, i.e. the artificial premature "climacteric."

2. Ovariectomy, besides developing the well-known atrophy of sex organs, produces hyperaemia and some hypoplasia in the reticularis zone of adrenals. The thyroids show histologic changes indicating some depression of function in this gland.

3. In accordance with Schultze's observations, the fatter ovariectomised rats had a less active thyroid, as seen histologically, than the thinner ones.

4. Administration of thyroid hormone in these spayed rats very slightly improves the histologic structure of the uterus and produces a tendency to progestational-like changes in the vagina. In the adrenals it slightly enlarges the size of the fasciculata cells and the size of some of their nuclei, greatly increases the width of the fasciculata and reticularis zones, and produces hyperaemia of the latter zone sometimes accompanied by depletion of lipoid granules. As compared with the cortex, the adrenal medulla becomes only very slightly enlarged. The thyroid gland becomes depressed.

5. Androsterone very slightly improves the atrophic condition of the uterus, but that of the vagina to a greater degree. In the adrenals it appears to decrease the size of the fasciculata cells, and diminishes the width of the fasciculata and reticularis zones with a varying degree of depletion of lipoid granules. The thyroid shows slight histologic changes which indicate stimulation of this gland.

6. Oestradiol B.B., in the doses used, returns the structure of uterus and vagina towards normal, with, however, some pathologic changes in the uterus. In the adrenals it slightly enlarges the size of the fasciculata cells, and considerably enlarges the width of the fasciculata and reticularis zones. With larger doses oestradiol depletes the z. glomerulosa of lipoid granules, and produces hyperaemia and hypoplastic and degenerative changes in the z. reticularis. The thyroid gland exhibited no significant changes.

7. In spite of great hypertrophic changes produced in adrenals by the hormones or combinations of hormones used, the reciprocal relationship of different zones and medulla in adrenals did not deviate considerably from the normal condition. This suggests the significance of these hormones, especially in combinations, as natural physiologic stimulants for certain organs and glands.

8. Among the special correlative effects of these hormones, when they are ad-

ministered simultaneously, it is necessary to emphasise:

a) their co-operative action in returning the structure of uterus and vagina towards the normal condition, and in stimulating development of these organs,

b) the co-operative action of oestrogenic and thyroid hormones in stimulating adrenal hypertrophy,

c) the neutralising effect of certain doses of thyroid and oestrogenic hormones on the hypoplasia and lipoid depletion produced in adrenals by androgenic hormones, and

d) some neutralising effect of androsterone on depression of the thyroid gland produced by administration of small doses of thyroid hormone (the effects of large doses of this hormone being more resistant to this action).

9. Thus, in general the correlative effects of these hormones (as observed histologically in our experiments on rats) indicated that their stimulating and possibly, in a certain sense, anti-aging action on the uterus, vagina, and adrenals produced more normal hypertrophic changes in these organs after simultaneous administration of all three hormones. On the thyroid gland, however, some weak stimulating effect was exerted only by the androgen out of three hormones used.

10. Since pathologic metaplastic changes occurred in the uterus with all these hormones, the combination used is still not a complete one for producing normal hypertrophic stimulation of this organ, at least one more hormone, progesterone, being necessary.

11. Simultaneous administration of the hormones may prevent some damaging effects, due to hyperhormonisation produced by a single hormone only. Such hypersecretion of a single hormone is unnatural in the normal organism.

12. If confirmed on human beings, these results might indicate the desirability of plurihormonal treatment for general (perhaps in particular, anti-aging) stimulation of the organism. This of course would not apply to special cases in which definite symptoms of deficiency of only one particular hormone are present.

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St. Augustine on the Longevity of the Antediluvians

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WITH THE PREDICTIONS OF GREATLY INCREASING LIFE EXPECTANCY FOR MAN, MR. GRIFFIN FOCUSES ATTENTION UPON THE AMAZING LONGEVITY OF THE ANTEDILUVIANS. ALTHOUGH NONE OF THEM ATTAINED THE AGE OF A THOUSAND, SEVERAL EXCEEDED THE AGE OF 900, AND NONE WHOSE AGE IS MENTIONED IN THE BIBLE LIVED LESS THEN 753 YEARS. SINCE THE DISCREPANCY BETWEEN OUR SPAN OF LIFE AND THEIRS IS SO GREAT, IT IS OFTEN QUESTIONED WHETHER THE ANCIENTS MEASURED TIME AS WE DO. MR. GRIFFIN SHOWS THAT ST. AUGUSTINE CONSIDERED THE APPARENT DIVERGENCE IN THE CALCULATION OF AGE BETWEEN THE HEBREW TEXT OF THE SCRIPTURES AND THE SEPTUAGINT VERSION AND REFUTED THE ARGUMENTS ADVANCED BY THE OPPONENTS OF THE LATTER.

THE great number of aged in our midst at the present time, together with scientists' predictions of a continuing rise in life-expectancy, serves to focus more and more meditation on the question: What is the normal span of human life? Highly significant indeed, is the recent announcement by research analysts that during 1944, for the first time in our history, the average length of life (the expectation of life at birth) of the American people, including military personnel within the country, exceeded sixty-five years. Simultaneously, the estimate was advanced that in a relatively brief period the average duration to be anticipated will be beyond the famous Biblical three score and ten (1). In view of these facts a special fascination is attached to the multi-centuried lives attributed to the primitive patriarchs whose years are registered in the annals of sacred Scripture.

Of the progenitor of humankind, *Genesis*, the first book of the Bible, records: "Adam lived a hundred and thirty years, and begot a son to his own image and likeness, and called his name Seth. And the days of Adam after he begot Seth, were eight hundred years: and he begot sons and daughters. And all the time that Adam lived came to nine hundred and thirty years, and he died" (2). The son of Adam, while not quite equalling the length of days of his forbear, lived "nine hundred and twelve years" (3). Enos, the son of Seth, died still younger for: "all the days of Enos were nine hundred and five years and he died" (4). But Cainan, the son of Enos, outlived his father since: "all the days of Cainan were nine hundred and ten years" (5). Cainan's progeny Malaleel, however, failed to reach the ninth century mark succumbing after "eight hundred and ninety-five years" (6).

As the principal genealogy unfolds in the

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Bible a notable variation of age is evidenced, although all the personages mentioned achieve goals beyond the dreams of modern mortals. Thus Jared, begotton of Malaleel, surpassed even Adam in longevity for: "all the days of Jared were nine hundred and sixty-two years" (7) while *his* son Henoch passed away at the comparatively early age of three hundred and sixty-five years. The Scriptural scrivener obviously considered the death of Henoch at such an early age as an unusual sort of tragedy for there is a lugubrious lament in his appended notation: "And all the days of Henoch were three hundred and sixty-five years. *And he walked with God, and was seen no more: because God took him*" (8).

No such premature fate, however, overtook Henoch's son Mathusala, preeminent among centenarians, whose phenomenal career extended through: "nine hundred and sixty-nine years" (9). The days of Lamech, the son of Mathusala and the father of Noe, were but "seven hundred and seventy-seven years" (10). It was "in the six hundredth year of the life of Noe, in the second month, on the seventeenth day of the month, [that] all the fountains of the great deep were broken up, and the flood gates of heaven were opened: and the rain fell upon the earth forty days and forty nights" (11). Subsequent to the drama of the Deluge it is set down that: "Noe lived after the flood three hundred and fifty years: and all his days were in the whole, nine hundred and fifty years, and he died" (12).

The relatively astounding longevity of our primal ancestors is naturally provocative of speculation. Has the race progressed or deteriorated from its pristine state? Is the Biblical schedule of years defensible? Did the ancients reckon time as we do? It is interesting and heartening to know that the creative and constructive genius of the supremely intellectual St. Augustine was exercised upon virtually all the relevant questions back in the fifth century of the Christian era!

It is in the course of his magnificent classic, *De Civitate Dei, The City of God,* that the learned Bishop of Hippo is led to a consideration of the longevity of the antediluvians. In detailing the consequences of Cain's crime, Holy Writ declares: "Cain went out from the face of the Lord, and dwelt as a fugitive on the earth, at the east side of Eden. And Cain knew his wife, and she conceived and brought forth Henoch; and he built a city, and called the name thereof by the name of his son Henoch" (13). It is to the skeptics who professed doubt that one man could, at that time, build a city, that the Doctor of Universal History addressed his attention. Very candidly he states: "At present it is the history which I aim at defending, that Scripture may not be reckoned incredible when it relates that one man built a city at a time when there seems to have been but four men upon earth, or rather indeed but three, after one brother slew the other,—to wit, the first man the father of all, and Cain himself and his son Enoch, by whose name the city was itself called" (14).

Immediately, Augustine undermines the argument of the naive objectors by pointing out: "they who are moved by this consideration forget to take into account that the writer of the sacred history does not necessarily mention all the men who might be alive at that time, but those only whom the scope of his work required him to name.

The design of that writer was to descend to Abraham through the succession of ascertained generations propagated from one man . . ." (15). "Accordingly," he concludes, "when the divine Scripture, in mentioning the number of years which those men lived, terminates its account of each man of whom it speaks, with these words: 'And he begot sons and daughters, and all his days were so and so, and he died,' are we to understand that, because it does not name those sons and daughters, therefore, during that long period of years over which one lifetime extended in those early days, there might not have been born very many men, by whose united numbers not one but several cities might have been built?" (16).

In tracing the genealogies of the primitives, the Scripture, as Augustine points out, invariably indicates that "so-and-so lived so many hundred years and begot so-and-so and after he begot so-and-so he lived so many years." For example, it is said: "Seth also lived a hundred and five years, and begot Enos" (17) . . . "and Enos lived ninety years, and begot Cainan" (18) . . . "Cainan lived seventy years, and begot Malaleel" (19). In interpreting such recordings, St. Augustine premises the very important principle that the children so specifically named are not therefore to be assumed to be the first-born. He buttresses his position very formidably in this regard, while at the same time demonstrating that the very longevity of the ancients lends credibility to the probability of one building a city during his lifetime.

His thesis, attractively formulated, exhibits brilliantly the thoroughness with which he studied the whole subject. Thus he elaborates: "Although it is written, 'and Cain knew his wife, and she conceived and bore Enoch, and he builded a city, and called the name of the city after the name of his son Enoch' [*Gen.* IV, 17], it does not follow that we are to believe this to have been his first-born; for we cannot suppose that this is proved by the expression 'he knew his wife,' as if then for the first time. . . . For in the case of Adam, the father of all, the expression is used not only when Cain, who seems to have been his first-born, was conceived, but also afterwards the same Scripture says, 'Adam knew Eve his wife, and she conceived and bore a son, and called his name Seth.' [*Gen.* IV. 25]. Whence it is obvious that Scripture employs this expression neither always when a birth is recorded nor then only when the nativity of a first-born is mentioned. Neither is it necessary to suppose that Enoch was Cain's first-born because he named the city after him. For it is quite possible that though he had other sons, yet for some reason the father loved him more than the rest. Judah was not the first-born though he gave his name to Judea and the Jews. But even though Enoch was the first-born of the city's founder, that is no reason for supposing that the father named the city after him as soon as he was born; for at that time, he, being but a solitary man, could not have founded a civic community, which is nothing else than a multitude of men bound together by some associating tie. But when his family increased to such numbers that he had quite a population, then it became possible to him both to build a city, and give it, when founded, the name of his son. For, so long was the life of those antediluvians, that he who lived the shortest time of those whose years are mentioned in Scripture attained to the age of 753 years [Lamech, according to the Septaugint]. And though no one attained the age of a thousand years, several exceeded the age of nine hundred. Who then can doubt that during the lifetime of one man the human race might be so multiplied that there would be a population to build and to occupy not one but several cities?"

To clinch his point, Augustine illustrates the fecundity of the patriarchs by citing: "this might very readily be conjectured from the fact that from one man, Abraham, in not much more than four hundred years, the numbers of the Hebrew race so increased, that in the exodus of that people from Egypt there are recorded to have been

six hundred thousand men capable of bearing arms [*Ex.* XII: 37], and over and above the Idumeans, who, though not numbered with Israel's descendants, were yet sprung from his brother, also a grandson of Abraham; and over and above the other nations which were of the same stock of Abraham, though not through Sara,—Ismaelites, Midianites, etc." (20).

The impressive accumulation of facts is certainly sufficient to show that Cain could have built a city in his long lifetime. There is only one possible alternative for Augustine's opponents. They may choose to doubt the fundamental truth of the Scriptural statements about the longevity of the primitives. The philosopher of history does not shrink, however, from debating such a notion. Concluding his previously offered evidence he places the question directly: "Wherefore no one who considerately weighs the facts will doubt that Cain might have built a city, and that a large one, when it is observed how prolonged were the lives of men, unless perhaps some skeptic take exception to this very length of years which our authors ascribe to the antediluvians, and deny that this is credible" (21).

In view of the accepted anthropologic findings of our present day scientists, it is not a little surprising to observe Augustine's first line of attack against those who doubt the longevity of the ancients. He says that the same persons question the allegedly great stature of the primitives although there is an abundance of evidence to support the theory. A modern savant could scarcely improve on the cogency of Augustine's well-marshalled reasonings. Of the incredulous he avers: "So, too, they do not believe that the size of men's bodies was larger then than now, though the most esteemed of their own poets, Virgil, asserts the same, when he speaks of that huge stone which had been fixed as a landmark, and which a strong man of those ancient times snatched up as he fought, and ran, and hurled, and cast it,—

> 'Scarce twelve strong men of later mould
> That weight could on their necks uphold'
> [*Aeneid*, XII: 899–900]

thus declaring his opinion that the earth then produced mightier men. And if in the more recent times, how much more in the ages before the world-renowned deluge? But the large size of the primitive human body is often proved to the incredulous by the exposure of sepulchres, either through the wear of time or the violence of torrents, or some accident, and in which bones of incredible size have been found or have rolled out. I myself, along with some others, saw on the shore at Utica a man's molar tooth of such a size, that if it were cut down into teeth such as we have, a hundred, I fancy, could have been made out of it. But that, I believe, belonged to some giant. For though the bodies of ordinary men were then larger than ours, the giants surpassed all in stature. And neither in our own age nor any other have there been wanting instances of gigantic stature though they may be few. The younger Pliny, a most learned man, maintains that the older the world becomes, the smaller will be the bodies of men [*Hist. Nat.* VII: 16]. And he mentions that Homer in his poems often lamented the same decline; and this he does not laugh at as a poetical figment, but in his character of recorder of natural wonders accepts it as historically true. But, as I said, the bones which are from time to time discovered prove the size of the bodies of the ancients, and will do so to future ages for they are slow to decay. But the length of an antediluvian's life cannot now be proved by any such monumental evidence. But as we are not on this account to withold our faith from the sacred history, whose statements of past facts we are the more inexcusable in discrediting, as is the accuracy of its prediction of what was future" (22).

There is yet another difficulty and Augustine entertains no intention of avoiding it. It is the apparent divergence between the Hebrew text of the Scriptures and the Septaugint version insofar as the calculation of the ages of those mentioned in the heralded lineage is concerned. But as Augustine illustrates in detail, though there is a difference in the method of computation there is no dissension but rather con-

currence as far as the fact of longevity is at stake. "Although there is a discrepancy," he says, "for which I cannot account between our manuscripts and the Hebrew, in the very number of years assigned to the antediluvians, yet the discrepancy is not so great that they do not agree about their longevity" (23).

The nature of the discrepancy, which assumes appreciable significance in only two instances, is fully delineated: "The very first man, Adam, before he begot his son Seth, is in our manuscripts, found to have lived 230 years, but in the Hebrew manuscripts 130. But after he begot Seth, our copies read that he lived 700 years, while the Hebrew gave 800. And thus, when the two periods are taken together, the sum agrees and so throughout the succeeding generations, the period before the father begets a son is always made shorter by 100 years in the Hebrew, but the period after his son is begotten is longer by 100 years in the Hebrew than in our copies. And thus, taking the two periods together, the result is the same in both. And in the sixth generation there is no discrepancy at all. In the seventh, however, of which Enoch is the representative, who is recorded to have been translated without death because he pleased God, there is the same discrepancy as in the first five generations, 100 years more being ascribed to him by our manuscripts before he begot a son. But still the result agrees; for according to both documents he lived before he was translated 365 years. In the eighth generation the discrepancy is less than in the others, and of a different kind. For Methuselah, whom Enoch begot, lived, before he begot his successor, not 100 years less but 100 years more, according to the Hebrew reading; and in our manuscripts again these years are added to the period after he begot his son; so that in this case also the sum-total is the same. And it is only in the ninth generation, that is, in the age of Lamech, Methuselah's son and Noah's father, that there is a discrepancy in the sum-total; and even in this case it is slight. For the Hebrew manuscripts represent him as living twenty-four years more than ours assign to him. For before he begot his son, who was called Noah, six years fewer are given to him by the Hebrew manuscripts than by ours; but after he begot this son, they give him thirty years more than ours; so that deducting the former six, there remains, as we said, a surplus of twenty four" (24).

It is from the discrepancy noted, St. Augustine says, that there arose the famous controversy regarding the age of Methuselah, a controversy which St. Jerome declared (De Quaest. Heb. in *Gen.*) was famous in all the churches. It is genuinely inspiring to study the dispassionate attitude of scholarly objectivity which characterized Augustine's sifting of evidence and his contemptuous dismissal of rash accusations. "From this discrepancy," he expatiates, "between the Hebrew books and our own arises the well-known question as to the age of Methuselah; for it is computed that he lived fourteen years after the deluge, though Scripture relates that of all who were then upon the earth only the eight souls in the ark escaped destruction by the flood and of these Methuselah was not one. For according to our books, Methuselah, before he begot the son whom he called Lamech, lived 167 years; then Lamech himself, before his son Noah was born, lived 188 years, which together makes 355 years. Add to these the age of Noah at the date of the deluge, 600 years, and this gives a total of 955 from the birth of Methuselah to the year of the flood. Now all the years of the life of Methuselah are computed to be 969; for when he had lived 167 years, and had begotten his son Lamech, he then lived after this 802 years, which makes a total as we said, of 969 years. From this, if we deduct 955 years from the birth of Methuselah to the flood, there remains 14 years, which he is supposed to have lived after the flood" (25).

In order to explain the various discrepancies, some misled construers of the Scripture resorted to ingenious hypotheses which Augustine does not share. Of Methuselah's case, he says, "some suppose, that, though

he was not on earth (in which it is agreed that every living thing which could not naturally live in water perished), he was for a time with his father, who had been translated, and that he lived there till the flood had passed away. This hypothesis they adopt, that they may not cast a slight on the trustworthiness of versions which the Church has received into a position of high authority, and because they believe that the Jewish manuscripts rather than our own are in error. For they do not admit that this is a mistake of the translators, but maintain that there is a falsified statement in the original, from which, through the Greek, the Scripture has been translated into our own tongue. They say that it is not credible that the seventy translators, who simultaneously and unanimously produced one rendering, could have erred, or, in a case in which no interest of theirs was involved, could have falsified their translation; but that the Jews envying us our translation of their Law and Prophets, have made alterations in their texts so as to undermine the authority of ours" (26).

Augustine speedily relegates the several charges adduced to oblivion. He does not think it sound either to indict the Hebrew textualists or to impugn the editors of the Septuagint. He simply attributes the minor errors to typographical blundering. For the repetitious discrepancy of 100 years which he carefully distinguishes from the rarer mistakes, he has a more subtle explication.

In regard to the former he challenges his contenders: "if I ask them which of the two is more credible that the Jewish nation, scattered far and wide, could have unanimously conspired to forge this lie, and so, through envying others the authority of their Scriptures, have deprived themselves of their verity; or that seventy men, who were also themselves Jews, shut up in one place (for Ptolemy, King of Egypt, had got them together for this work), should have envied foreign nations that same truth, and by common consent inserted these errors: who does not see which can be more naturally and readily believed? But far be it from any prudent man to believe either that the Jews, however malicious and wrong-headed, could have tampered with so many and so widely dispersed manuscripts; or that those renowned seventy individuals had any common purpose to grudge the truth to the nations. One must therefore, more plausibly maintain, that when first their labors began to be transcribed from the copy in Ptolemy's library, some such misstatement might find its way into the first copy made, and from it might be disseminated far and wide; and that this might arise from no fraud, but from a mere copyist's error. This is a sufficiently plausible account of the difficulty regarding Methuselah's life, and of that other case in which there is a difference in the total of twenty-four years" (27).

While the occasional error, in Augustine's opinion, was due to the transcribers understandable nodding, he is convinced that deliberate and rather foolhardy cunning entered into the consistent miscalculations of the centuries. The copyist, to his mind, decided that the stark relation of longevity in the Scriptures might prove unpalatable to his perhaps cynical contemporaries, and so he invented an arrangement based on two notorious misapprehensions, which Augustine will eventually expose.

To anyone interested in the problems of gerontology Augustine's disquisition cannot but prove absorbing. He declares: "In those cases in which there is a methodical resemblance in the falsification, so that uniformly the one version allots to the period before a son and successor is born 100 years more than the other, and to the period subsequent 100 years less, and vice versa, so that the totals may agree,—and this holds true of the first, second, third, fourth, fifth, and seventh generations,—in these cases error seems to have, if we may say so, a certain kind of constancy, and savours not of accident, but of design.

"Accordingly, that diversity of numbers which distinguishes the Hebrew from the Greek and Latin copies of Scripture, and which consists of a uniform addition and

deduction of 100 years in each lifetime for several consecutive generations, is to be attributed neither to the malice of the Jews, nor to men so diligent and prudent as the seventy translators, but to the error of the copyist who was first allowed to transcribe the manuscript from the library of the above-mentioned king. For even now, in cases where numbers contribute nothing to the easier comprehension or more satisfactory knowledge of anything, they are both carelessly transcribed, and still more carelessly emended. For who will trouble himself to learn how many thousand men the several tribes of Israel contained? He sees no resulting benefit of such knowledge. Or how many men are aware of the vast advantage that lies hid in this knowledge? But in this case, in which during so many consecutive generations, 100 years are added in one manuscript where they are not reckoned in the other, and then, after the birth of the son and successor, the years which were wanting are added, it is obvious that the copyist who contrived this arrangement designed to insinuate that the andediluvian lived an excessive number of years only because each year was excessively brief, and that he tried to draw the attention to this fact by his statement of their age at puberty at which they became able to beget children. For, lest the incredulous might stumble at the difficulty of so long a lifetime, he insinuated that 100 of their years equalled but ten of ours; and this insinuation he conveyed by adding 100 years whenever he found the age below 160 years or thereabouts, deducting these years again from the period after the son's birth, that the total might harmonize. By this means he intended to ascribe the generation of offspring to a fit age, without diminishing the total sum of years ascribed to the lifetime of the individuals" (28).

That Augustine is not merely guessing is made manifest by the fine texture of his thinking. He continues: "and the very fact that in the sixth generation he departed from this uniform practice, inclines us all the more to believe that when the circumstances referred to required his alterations, he made them; seeing that when this circumstance did not exist, he made no alteration. For in the same generation he found in the Hebrew manuscript that Jared lived before he begot Enoch 162 years, which according to the short year computation, is sixteen years and somewhat less than two months, an age capable of procreation; and therefore it was not necessary to add 100 short years and so make the age twenty-six years of the usual length; and of course, it was not necessary to deduct, after the son's birth, years which he had not added before it. And thus it comes to pass that in this instance there is no variation between the two manuscripts" (29).

Nor is this all. "This is corroborated still further by the fact that in the eighth generation, while the Hebrew books assign 182 years to Methuselah before Lamech's birth, ours assign to him twenty less, though usually 100 years are added to the period; then, after Lamech's birth, the twenty years are restored, so as to equalize the total in the two books. For if his design was that these 170 years be understood as seventeen, so as to suit the age of puberty, as there was no need for him adding anything, so there was none for his subtracting anything; for in this case he found an age fit for the generation of children, for the sake of which he was in the habit of adding those 100 years in cases which we might indeed, have supposed had happened accidentally, had he not taken care to restore them afterwards as he had deducted them from the period before, so that there might be no deficiency in the total" (30).

As sort of an afterthought, Augustine asks: "Or are we perhaps to suppose that there was the still more astute design of concealing the deliberate and uniform addition of 100 years to the first period and their deduction from the subsequent period, —did he design to conceal this by doing something similar, that is to say, adding and deducting, not indeed a century, but some years even in a case in which there was no need of his doing so?" "But what-

ever may be thought of this," Augustine insists, "whether it be believed that he did so or not, whether, in fine, it be so or not, I would have no manner of doubt that when any diversity is found in the books, since both cannot be true to fact, we do well to believe in preference that language out of which the translation was made into another by translators. For there are three Greek manuscripts, one Latin, and one Syrian, which agree with one another, and in all of these Methuselah is said to have died six years before the deluge" (31).

What of the supposition that ten antediluvian years were equivalent to but one of ours? The theory is fully treated by Augustine who finds it unacceptable. In true scholastic style he defines the precise composition of the ancient calendar and sets forth all the points in favor of the theory in question before he demolishes it. He writes: "They are by no means to be listened to who suppose that in those times years were differently reckoned, and were so short that one of our years may be supposed to be equal to ten of theirs. So that they say, when we read or hear that some man lived 900 years, we should understand ninety,—ten of those years making but one of ours, and ten of ours equalling 100 of theirs. Consequently, as they suppose, Adam was twenty-three years of age when he begot Seth, and Seth himself was twenty years and six months old when his son Enos was born, though the Scripture calls these months 205 years" (32).

Such is the basic theory. Augustine now proceeds to describe the manner in which the ancient calendar was assembled, and the relation of the same to the hypothesis which he disavows: "For, on the hypothesis of those whose opinion we are explaining, it was customary to divide one such year as we have into ten parts, and to call each part a year. And each of these parts was composed of six days squared; because God finished his work (of creation) in six days, that he might rest the seventh. Now six squared, or six times six, gives thirty-six days; and this multiplied by ten amounts to 360 days, or twelve lunar months. As for the five remaining days which are needed to complete the solar year, and for the fourth part of a day, which requires that into every twenty-fourth or leap year a day may be added, the ancients added such days as the Romans used to call 'intercalary,' in order to complete the number of years. So that Enos, Seth's son, was nineteen years old when his son Cainan was born, though Scripture calls these years 190. And so through all the generations in which the age of the antediluvians are given, we find that in our versions that almost no one begot a son at the age of 100 or under, or even at the age of 120 or thereabouts; but the youngest fathers are recorded to have been 160 years old and upwards. And the reason of this they say, is that no one can beget children when he is ten years old, the age spoken of by those men as 100, but that sixteen is the age of puberty, and competent now to propagate offspring; and this is the age called by them 160. And that it may not be thought incredible that in those days the year was differently computed from our own, they adduce what is recorded by several writers of history, that the Egyptians had a year of four months, the Acarmanians of six, and the Lavinians of thirteen months. . . . By these plausible arguments certain persons with no desire to weaken the credit of the sacred history, but rather to facilitate belief in it by removing the difficulty of such incredible longevity, have been themselves persuaded, and think they act wisely in persuading others, that in these days the year was so brief that ten of their years equal but one of ours, while ten of ours equal 100 of theirs. But there is the plainest evidence to show that this is quite false" (33).

In the first place, before adverting to contradictory evidence in our Scripture, Augustine undermines the theory by quoting the Hebrew text against the theorists, declaring: "Before producing this evidence however, it seems right to mention a conjecture which is yet more plausible. From the Hebrew manuscripts we could at once refute this confident statement; for in them

Adam is found not to have lived 230 but 130 years before he begot his third son. If, then, this means thirteen years by our ordinary computation, then he must have begotten his first son when he was only twelve or thereabouts. Who can at this age beget children according to the ordinary and familiar course of nature? But not to mention him, since it is possible that he may have been able to beget his like as soon as he was created,—for it is not credible that he was created as little as our infants are,—not to mention him, his son was not 205 years old when he begot Enos, as our versions have it, but 105, and consequently, according to this idea, was not eleven years old. But what shall I say of his son Cainan who, though by our version 170 years old, was by the Hebrew text seventy when he begot Malaleel? If seventy years in those times meant only seven of our years, what man seven years old begets children?" (34)

After this superb use of the *reductio ad absurdum*, St. Augustine transfers his exegetical skill to an exposition of the Christian Scripture in the light of which he renders yet more ridiculous the theory he condemns. "Let us now see," he says, "how it can be plainly made out that in the enormously protracted lives of those men the years were not so short that ten of their years were equal to only one of ours, but were of as great length as our own, which are measured by the course of the sun. It is proved by this, that Scripture states that the flood occurred in the six hundredth year of Noah's life. But why in the same place is it also written, 'The waters of the flood were upon the earth in the six hundredth year of Noah's life, in the second month, the twenty-seventh day of the month' [*Gen.* VII: 10, 11] if that very brief year (of which it took ten to make one of ours) consisted of thirty-six days? For so scant a year, if the ancient usage dignified it with the name of year, either has not months, or its month must be three days, so that it may have twelve of them. How then was it said, 'In the six hundredth year, the second month, the twenty-seventh day of the month' unless the months then were the same as the months now? For how else could it be said that the flood began on the twenty-seventh day of the second month? Then afterwards, at the end of the flood, it is thus written: 'And the ark rested in the seventh month, on the twenty-seventh day of the month, on the mountains of Ararat. And the waters decreased continually until the eleventh month: on the first day of the month were the tops of the mountains seen' [*Gen.* VIII: 4, 5]. But if the months were such as we have, then so were the years. And certainly months of three days each could not have a twenty-seventh day. Or if every measure of time was diminished in proporti n, and a thirtieth part of three days was then called a day, then that great deluge, which is recorded to have lasted forty days and forty nights, was really over in less than four of our days. Who can away with such foolishness and absurdity? Far be this error from us,—an error which seeks to build up our faith in the divine Scriptures on false conjectures, only to demolish our faith at another point" (35).

To Augustine the resultant is inevitable. "It is plain," he concludes, "that the day then was what it is now, a space of four and twenty hours, determined by the lapse of day and night; the month then equal to the month now, which is defined by the rise and completion of one moon; the year then equal to the year now, which is completed by twelve lunar months, with the addition of five days and a fourth to adjust it with the course of the sun. It was a year of this length which was reckoned the six hundredth of Noah's life; and in the second month, the twenty-seventh day of the month, the flood began,—a flood which as is recorded, was caused by heavy rains continuing for forty days, which days had not only two hours and a little more, but four and twenty hours, completing a night and a day. And consequently those antediluvians lived more than 900 years, which were years as long as those which afterwards Abraham lived 175 of, and after him his son Isaac 180, and his son Joseph

nearly 150, and some time after, Moses 120, and men now seventy or eighty, or not much longer, of which years it is said [*Ps.* XC: 10]: their strength is labour and sorrow" (36).

Finally, Augustine deals with the possible lateness of puberty in the ancients which some consider as being implied in the Scriptural narrative. He is convinced that such an assumption arises from a superficial reading of the sacred history by persons who erroneously infer that the children specifically mentioned in the genealogies were the first-born. Judging from Augustine's whole analysis there were some in his day who, whatever the mental price, simply could not or would not become reconciled to the biblical tables recording the longevity of the primitives. That their popular constructions were not too abstruce may be gathered from the logic of the Saint.

"Some one, then, will say," Augustine affirms, "is it to be believed that a man who intended to beget children, and cherished no intention of continence, abstained from marital congress a hundred years and more, or even, according to the Hebrew version, only a little less, say eighty, seventy, or sixty years; or, if he did not abstain, was unable to produce progeny? This question admits of two solutions. For either puberty was so much later as the whole life was longer, or, which seems to me more likely, it is not the first-born sons that are here mentioned, but those whose names were required to fill up the series until Noah was reached, from whom again we see that the succession is continued to Abraham. . . . "

By way of illustration Augustine proceeds: "When Seth was born, the age of the father is mentioned; but already he had begotten other sons, and who will presume to say that Cain and Abel were the only ones previously begotten? For it does not follow that they alone had been begotten of Adam, because they alone were named in order to continue the series of generations which it was desirable to mention. For though the names of all the rest are buried in silence, yet it is said that Adam, begot sons and daughters; and who that cares to be free from the charge of temerity will dare to say how many his offspring numbered? . . . Because it is written, 'Seth lived 205 years' or, according to the Hebrew reading, '105 years, and begot Enos' [*Gen.* V: 6]. Who but a rash man could affirm that this was his first born? . . . Will any man do so when it is written of him, 'And he begot sons and daughters, and all the days of Seth were 912 years, and he died' [*Gen.* V: 8]. And similarly regarding those whose years are afterwards mentioned, it is not disguised that they begot sons and daughters" (37).

In summary, Augustine decides: "Consequently, it does not at all appear whether he who is named as the son was himself the first begotten. Nay, since it is incredible that those fathers were either so long in attaining puberty, or could not get wives, or could not impregnate them, it is also incredible that those sons were their first-born. But as the writer of sacred history designed to descend by well-marked intervals through a series of generations to the birth and life of Noah, in whose time the flood occurred, he mentioned not those sons who were first begotten but those by whom the succession was handed down" (38).

To clinch his argument, Augustine offers some irrefutable examples. "Let me make this clearer," he adds, "by here inserting an example, in regard to which no one can have any doubt that which I am asserting is true. The evangelist Matthew, where he designs to commit to our memories the generations of the Lord's flesh by a series of parents, beginning from Abraham and intending to reach David, says, 'Abraham begot Isaac' [*Matt.* I]; why did he not say Ishmael, whom he first begot? Then, 'Isaac begot Jacob' why did he not say Esau, who was the first-born? Simply because these sons would not have helped him to reach David. Then follows, 'And Jacob begot Judah and his brethren'; was Judah the

first begotten? 'Judah,' he says, 'begot Pharez and Zara'; yet neither were these twins the first born of Judah, but before them he had begotten three other sons. And so in the order of the generations he retained those by whom he might reach David, so as to proceed onwards to the end he had in view. And from this we may understand that the antediluvians who are mentioned were not the first born, but those through whom the order of the succeeding generations might be carried on to the patriarch Noah. We need not therefore, weary ourselves with discussing the needless and obscure question as to their lateness of reaching puberty" (39).

Of one thing we may rest absolutely assured—the illustrious St. Augustine who wrote his magnificent masterpiece *De Civitate Dei* between his fifty-ninth and seventy-second year (40), was a firm believer in the longevity of the antediluvians.

Summary

The views of St. Augustine on the longevity of the antediluvians are discussed in detail in this paper. St. Augustine presented voluminous evidence to support the belief that life spans of several hundred years, in fact, as long as 969 years, actually were achieved by some of the antediluvians.

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Changing Trends in the Care of the Aged

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THE LAST FEW YEARS HAVE BROUGHT MANY NOTICEABLE CHANGES IN THE INSTITUTIONAL SERVICE PROVIDED BY HOMES FOR THE AGED. DR. WEIL CONTRASTS FORMER ADMISSION AND ADMINISTRATIVE PROCEDURES WITH THOSE CURRENTLY USED. WHILE MUCH PROGRESS HAS ALREADY BEEN MADE, HE EMPHASIZES THE NECESSITY FOR CONTINUED PLANNING. HE DIVIDES THE PROBLEM OF PROVIDING ADEQUATE CARE FOR THE AGED IN OLD FOLKS' HOMES INTO THREE PARTS: ADMISSIONS, ADMINISTRATION, AND PROGRAM, AND ILLUSTRATES HOW THE CHANGING TRENDS HAVE AFFECTED THE MONTEFIORE HOME.

IN 1940 the care of the aged in old folks' homes took a sharp turn away from the traditional concept that to be aged meant to be old, exhausted, useless, and that to arrive at a certain point in the life span meant to relinquish the rights of productivity and to accept the stigma of classification in the outmoded group of our population.

Old folks' homes have been regarded as shelter homes, institutions in which members of an unproductive population group were provided with housing, food, clothing, and companionship of contemporaries. The best possible care was viewed as treating inmates with kindness and protecting them from the inclemencies of life.

However, in recent years institutional care has been broadened in many ways. In order to understand modern trends in the care of the aged, former admission and administrative procedures must first be considered.

Former Admission Procedures

A recent study of admission procedures in various homes for the aged in the State of Ohio presented a wide range of obsolete regulations. A glance at these former admission requirements in homes for the aged brings to mind the elderly applicants who must have been terrified by the "you shall—you may—you must character" of such iron-clad application rules. They present on one side the powerful status of the institution, the position of being able to grant or reject, and on the other side the submissive helplessness of the client and the stigma of dependency.

The results of such admission requirements are apparent. Clients—themselves, their children, relatives, or friends applying for them—would do everything in their power to comply with the regulations in order to gain admission. They would repress any personal thinking or wish regarding their entrance into the home out of sheer fear that it might endanger their admittance. Such application requirements, duly signed by the applicant, would in many cases show distinct deviations from the actual case history, and whatever the applicant tried to conceal with his statements was colored by the rigid frame of admission practice.

Consider the case of an aged woman who for many years lived separated from her husband, but, for the sake of her family, had not been legally divorced. However great her need for placement in our Home might have been in later years, she would not have been admitted, on the basis of our Home's old admission policy, if her husband were alive. Reading further in these admission requirements, it is found that misstatements and concealment of facts might be followed by the resident's immediate dismissal from the home. The adjustment of those residents whose admission was handled with a resultant sword of Damocles constantly above their heads must have been very difficult.

In many instances such admission requirements were supplemented by the so-

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A paper read at the Indiana State Conference in Indianapolis, November 1, 1946, formed the basis of this article.

called house rules of the institution. The analogy between these house rules and those mentioned in a study made a few years ago by Judge Polier of New York entitled *Life and Development of the Old type Orphan Home* is amazing. There was only one section missing in the old folks' home set of rules and that was the exact wording of the prayers with which the inmates of the old type orphan home had to start and to close the day, to be spoken together, aloud, for their benefactors of the home and those who paid for their food.

The ill effects which such forced dependency has on children has been known for many years. It is about to be recognized that such artificial feelings of dependency are not less injurious to the well-being and happiness of an old person, and especially to the adjustment of a resident in an old folks' home. If the profound feelings of insecurity with which almost every application to an old folks' home is initiated are evaluated, we can more readily understand the unsoundness of the old admission procedure. The application, even though it requires the signature of the applicant, usually was initiated by his children or relatives. In many cases the plan was made without consultation or discussion with the applicant himself. The planning was done for him and often the aged himself was bewildered by the decision made for his future.

One of the admission requirements stated that small savings, which would be insufficient for the support of the applicant's remaining years, or other types of financial assets, must be turned over to the institution. After the formal application was submitted to the Admissions Committee, several members of this Committee were assigned to visit the applicant, or to interrogate him and his children in the office of the institution, or in the office of one of the Committee, regarding his financial status. In later years a few of the more progressive homes utilized the service of a family agency for the investigation of an applicant. The agency's reports were considered a time-saving device, but offered only a preliminary basis for the reinvestigation and final evaluation by the Admissions Committee. It had been a general practice in most of the homes to accept the applicant only on a mutual probationary period varying from thirty to ninety days. During this time, the resident was on trial for proof of his suitability and fitness in the institution, while he himself had a formal right to make his final decision.

On the basis of such admission procedures, it is interesting to consider the type of client the homes have admitted. Such clients were usually aged persons, dependent economically as well as socially, physically well but intellectually dull, and whose failures in life or lack of family relations left them no alternative but entrance into an old folks' home. They were the type which made up the usual old folks' home population. The resignation of the aged to a useless life brought no opposition to harsh admission procedures and requirements, and their eagerness to be sheltered made them indifferent and submissive inmates of an old folks' home.

Our own records produce the recommendation of a social agency which contained the following statement made in

1940: "Mr. B. seems the congenial type of old man who would adjust well in an institution because of his simple tastes and simple needs and his pleasant and easy-going disposition." This statement referred to a resident who was one of the most perplexing clients, a father who was rejected by his children because he had abandoned them in their youth. It is needless to point out how misleading such admission recommendations are to the management of a home and everyone concerned with the care of such a client.

Since an application for admission was taken as prima facie evidence of the applicant's economic need and his desire to enter the home, the underlying real cause for his application was hardly recognized. Little or no thought was given to other possible reasons, often connected with the family set-up, cultural and religious differences, educational gaps, and, most of all, the possible personality problems of an applicant. Thus, the homes for the aged were filled with a seemingly destitute group of old people whose real needs remained unknown and unmet, while very often aged people in dire need of protective placement were denied admission. Small wonder, then, that such clientele readily became unruly, disgruntled, and morose residents. The sheer necessity for shelter, however, prevented such clients from expressing their feeling, and very rarely did new residents make use of their rights for final decision during the probationary period. Fear of loss of shelter and physical security coerced the aged to strict obedience to the house rules, and an occasional suspension or dismissal of a resident from the home had the effect of terrorizing others and making them submissive and obedient towards the authoritative regimentation of the institution.

Former Administrative Procedures

The administration of the homes for the aged was mostly in the hands of an older matron. In most cases emphasis was put on the maintenance of the institution. Uppermost in the mind of the matron were cleanliness and food, disciplinary functions being left to the Board. Since the potentialities of an aged person were unrecognized, no efforts were made to stimulate active living in an old folks' home. As a result, time dragged heavily for the aged, who were resigned to their doom of useless and gradual decline.

Homes admitted old people about whom the administration knew little or nothing, either in regard to their history or to the underlying reasons which prompted them to apply for entrance into an institution. Many of the aged parents who were admitted were rejected by their children, and usually these old people entered the home of the aged with deep-seated resentments. In many cases the hostility towards the children was projected to the institution and everyone who came in contact with them there. Those feelings of rejection usually resulted in embittered, troublesome, or indifferent behavior. In addition to this, the applicants were given little or no interpretation of what institutional life was like.

In most cases only the Board had knowledge of the client's factual background, and thus very little was done to prepare a sound relationship between the institutional management, the respective resident of the home, and his children. It was not realized how important it is for the resident's future adjustment that a good relationship be fostered between the aged's children and the institution. The role which the institutional administrator usually took was one of authority, and toward him the children took either an attitude of favoritism or resentment. Complaints of their parents presented to the institutional management were usually taken by the children as criticism of the superintendent, demand upon themselves, or at least as a sign of ungratefulness. Such attitudes necessarily increased the feeling of guilt which was already present in the children because of their inability to provide for their parents. It usually resulted in a defensive reaction directed against the institution, and the

aged resident as well as his complaining children were then labeled as trouble-makers. There is no doubt that such conflicts widened the gap between the aged, his children, and the institution to the detriment of the adjustment and well-being of the aged resident in the home.

This shows the close inter-relationship between obsolete methods of admission and inadequate institutional personnel, the latter ill-equipped to understand the problems which are individual with every human being, and unprepared to handle an aged person whose misgivings or failings in life have brought him into the trust of an institution and in the need of individual and skilled handling.

New Trends in Admission and Administrative Procedure

It is logical that pressures due to increasing needs force a greater awareness of the problems and lead to a search for a remedy. This very situation was experienced in the field of child care some three decades ago. The recognition of the underlying dynamics of the child's needs drew medicine, psychiatry, and social work into concerted action and brought about the high standard of care recognized in the child care programs of today.

The care of the aged has followed the same trend. The sociologic pressure of a rapidly changing, aging population, and the growing interest of medicine and psychiatry in the specialized field of geriatrics have drawn social work out of its indifference toward the aged client and nullified the belief that the aged offered no potentialities for individualized service. The acceptance of the aged person as an individual has changed this obsolete concept.

With the entry of science into the field of the aged, a new era was inaugurated for the old folks' home also. Professional interest gradually began to bring about changes in the philosophy of the care of the aged. One of the vital areas affected by this new trend was that of admission. Accepting the aged as an individual entails analysis and evaluation of his needs in relation to himself, to his family, to the community, and to group life within an old age home. Herein lies the basic principle of appropriate admission measures in general and an admission practice adapted to the home for the aged in particular.

One of the first elements of change in admission policy in the home for the aged is the recognition not only of economic but also of social needs as the precipitating cause for admission. A recent study made in our Home revealed that out of fifteen cases admitted on the basis of economic need, twelve proved to be the results of predominantly social problems. A further step in adequate admission procedures will be the careful selection of the type of client suitable for institutional placement, thus eliminating institutionalization of the aged who may be given their place in the community. The consequence of such admission policy will be that institutional facilities will be freed for the care of those who are socially needy, unadjustable, and chronically ill.

These principles are based on the concept that admission is an integral part of institutional work, that it is the initial and one of the most important steps of the entire service to an aged client. Therefore, it should never be handled apart from an institutional setting, but concomitant with it; it can no longer be a matter of clerical formality and economic investigation. Admission in the Montefiore Home is a specialized part of our work, a part that requires thorough experience and utmost skill. The time has passed when a client is admitted as just another old person. He is admitted as an individual with personal problems, needs, desires, and potentialities.

Wherever science has found entrance into a field of human welfare, it was the task of those working in the field to familiarize themselves with the findings and recommended methods. Institutional administrators of homes for the aged are now at the point where up-to-date information, reeducation, and retraining should be con-

stant guides in the work that will be more and more in the spotlight of social welfare. It would be useless to hang on to old customs and static rules at a time when new, approved methods of social work are finding application in institutions. It would be wise to learn from the field of child care where the progressive administrator was the one who was ready and skillful enough to combine the old, approved methods of administration and human relationship with the teaching of modern social work. With this in mind, it is easy to introduce new programs and new facilities for the care of aged clients into institutions.

Program

The most modern concepts of institutional care of the aged comprised the four following phases: case work, occupation, recreation, and research.

Case work in the field of the aged in general is still new. Its application in the institution will follow wherever modern social work procedure has entered the picture. One of the finest definitions of case work is that of Dr. Mayo: "Case work means mending human life." There is no field of social welfare where the need of mending human life is more urgent than in an institution of old, broken, and dependent men and women. The very fact that in the sunsets of their lives they had to seek protective placement in an old folks' home means mending hardships, disappointments, and failures, often leading back over a lifetime.

Why cannot the institutional administrators do this human mending, this specialized piece of work with the individuals? For many decades institutions have had to cope with the problems and difficulties of their people. There is no doubt that many administrators have the capacity to help people in their adjustment, but is the institutional head, whose functions lie in the administration of the home and the coordinating of the departments, the right person to go into the details of a human being's life, to sit down and evaluate the childhood, the youth, the adult accomplishments or failures with one of his residents? Are all these details necessary? Modern concepts of medicine, psychology, and psychiatry teach us that the problems of a human being can be evaluated and diagnosed only in the terms of the person's whole life, the variety of his experience, and the minute details on which his adjustment difficulty is based. Not many administrators have the time and the training to do that specialized handling called case work.

Case work in an institution of the aged means, roughly, that a trained worker is assigned to help the individual resident solve whatever problems arise within himself, in his personal adjustment, and in his adaptation within the institutional group. This requires that the case worker first dig out and collect every bit of information on the client's past history, his relationship with his spouse, his children, relatives, and friends, and above that, the reasons that prompted him to give up his community life for residence in a home for the aged.

It might easily appear that any person with a common sense approach could gather data and initial information, but the evaluation of the connection of such material with the behavior problems of the aged requires skill and thorough training. In a large number of applications, it was found that children or relatives, not the aged himself, had been decisive factors in the plan for institutional placement, and in many cases the break-up of the apartment of the aged person meant the breakdown of his own personality. Having to leave the homes of children is often identified with no longer being loved or wanted.

It is no wonder that these people bring apprehensions, aggressions, and difficult, demanding attitudes into the institutions. They take their feelings out on the management, the employees, and most of all on roommates or other residents. These are the people whom residents and employees then label as the trouble makers, and their rejection in the home adds difficulty to their already badly adjusted personalities. These people need and deserve the indi-

vidualized service of a worker whose specific training and acquired skill help them to adjust to themselves and to group life.

The experience in our institution, where we have used case work service for over two years, taught us that its continued use from the earliest steps of admission of a client is invaluable in the decision of admission and in the later adjustment of a resident. House visits by the case worker, wherever possible, and personal contact with whatever source of information the applicant has mentioned have proved essential in every case. A case worker, familiar with institutional life, will give the right interpretation of what institutional life will mean to the prospective resident, and on the other side she will be able to bring back to the home thorough evaluation of the client's problem, on the basis of which many later adjustment difficulties can be alleviated or even prevented.

The case of Mr. K., age 79, is an illustration. It was referred to us by the minister of the congregation to which one of the sons of the applicant had belonged for many years. The minister described it as an urgent situation, necessitating immediate action for the sake of all involved. Mr. K. is the father of five children, all married, the only one of whom in a position to house the father is the oldest son, whose child is physically retarded due to a birth injury.

The main reasons for the application for entry into the home were three: Mr. K. had recently lost his eyesight after an unsuccessful cataract operation; the daughter-in-law, worn out by the care of her child, refused to carry on the additional burden of care for the aged father; and the son claimed that the whole situation had affected his heart so much that he had to give up his business for the time being and move out of town. Immediately after the minister's recommendation, the two oldest sons brought their father for physical examination. During the formal interview of signing the application the father was almost completely silent. The medical picture was that of an able-bodied aged man with normal cardiac deterioration and almost no vision. Since the son with whom the father stayed intended to move within two weeks, we were asked for emergency action on this case.

After we had checked the initial data on the applicant and his family our case worker made a visit to the applicant's home. She reported him an aggressive, bitter old man who strongly resented her visit. He was surprised when she explained that the applicant himself has the right to decide what he wants to do, because he felt that his sons and the institution were working together to force him into an old folks' home. He told the case worker that he was looking forward to another eye operation which might give him back some of his eyesight so that he could do odd jobs as he had done as long as he could see and thus he would need neither his sons nor an institution. His attitude was explained to his children. In giving this man full understanding of his longing for independence and his children some insight into their father's emotions, far better service was given than premature admission into the home would have allowed. Mr. K's. operation was unsuccessful, but he had established a relationship of confidence with the case worker and he, himself, notified us that he wanted to enter the home.

Without case work service I would have voted against the admission of this man who came with a history of being rejected by his children and of being hated by his entire neighborhood. Due to the understanding of our worker, who was able to diagnose his deep-rooted personality difficulties long preceeding his blindness, he was gradually able to adapt himself to his handicap and was slowly accepted into the group. An operation on his eyes, arranged by our worker through the Society for the Blind, brought back some walking vision. This man has now adjusted to our Home, and his relationship to his children has eased and improved.

A case work program presupposes the use of all the scientific devices on which case work per se is dependent, the guidance

of medical and psychiatric consultation, and the establishment of occupational and recreational facilities. Since not enough is known about the experience of other institutions along these lines, the evaluation of the program of the Montefiore Home must serve as an example. The case work department is operated by a full time, trained case worker who is supervised by a case supervisor of an agency acknowledged for training by Western Reserve. The department has the benefit of semimonthly case consultation by a specialized case consultant. The chief psychiatrist of Mt. Sinai Hospital is available for admission as well as treatment purposes at the Mental Hygiene Clinic of Mt. Sinai. Attending physicians hold regular clinic twice a week and may be called at any time.

We are discussing with Mt. Sinai Hospital in Cleveland the possibility of establishing a medical council for consultation and research in geriatrics. The plan is to interest a group of Mt. Sinai Hospital physicians, possibly the heads of the various clinical departments, in serving as a medical council to our physicians. The functions of such a council would be: (1) supervision and guidance of our medical program (consultation with our physician on specific cases, counselling on special diseases of the aged, and lecturing to our nursing staff), and (2) promotion of research in the medical care of the aged (autopsies and study of findings, and interneship of a medical student in the Home). Such a council would be greatly beneficial to our work in particular and to the field in general.

Our occupational program, which is worked out in close cooperation with the case worker, physician, and psychiatrist, comprises the following workshops: Tailor, shoemaker, carpenter, three diversified work units, and a Home store. These Sheltered Workshops operate on a realistic basis; the people working in them are paid, and in a modified way their working hours and compensation approximate those of their former occupations.

Their earnings, called work benefits, place the residents not only in a position of usefulness but also of independence, since all the people employed in the Workshops use their earnings for their own clothing and personal needs. Besides this, work benefits above a certain amount are used as their contributions towards the residents' maintenance in the Home. In 1945 the amount thus paid by residents towards their maintenance was $176.36, and for the first three quarters of 1946, $132.36. The total paid to residents in work benefits from 1941 to December 31, 1945, was $8,205.33. A separate fund of the Occupational Department resulting from these earnings showed a balance of $1,326.27 as of September 30, 1946. This special fund is used for purchasing equipment in our workshops.

The decidedly favorable effect on our residents of such a useful life has proved to us that the desire for financial independence is one of the most valuable assets and is to be encouraged and to be retained as long as physical and mental capacities permit. For almost a year our workshop program has been under the guidance of an employed supervisor. As Sheltered Workshops they are subject to the regulations of the Wage and Hour Law.

Recreational activities, long denied to aged people, gradually found entrance too into the old folks' home. Since 1941 a diversified recreational program at Montefiore Home has been carried out by the residents through a social club. Regular entertainments, group singing, dancing, and dramatics are part of the group work program which, since January, 1946, has been directed by a trained worker. Emphasis on the change from being entertained to actively planning and participating in the recreation is evident. While the value of the recreational program is less tangible than the one of the Occupational Department, its gain lies in the favorable reflection on the entire group and on the happiness of the individual. The merits of both departments constitute the atmosphere in which the aged can lead a life of restored

usefulness and renewed interests.

Our program is appropriate for residents who are fairly able to be up and about, but the chronically ill who are more or less confined to the hospital or the infirmary of the institution present another problem. These patients cannot be drawn into active participation in any recreational activity. However, these residents, whom for the sake of better identification might be called custodial cases, can be passive spectators in all the affairs the recreational program provides. In a modified way it is also possible to draw some of these custodial cases into the occupational program and provide very simple, appropriate assembling work in the hospital.

The physically well aged whose social indigency brought them under the protection of the home might well benefit from all facilities of the home without losing their community living arrangement. For these people, called out-residents, the Montefiore Home rents private rooms with families in the vicinity of the Home. These residents eat all their meals in the Home and participate in all activities. This service has proved to be a source of freedom and security to those old people who are well enough to retain their private life but need the emotional security the institution provides.

To all intents and purposes it appears to be reasonably certain that the home for the aged will more and more be looked upon as the place for the chronically ill, the emotionally disturbed, and the mentally unbalanced aged person. The new trends in the care of the mentally ill foresee a much more scientific handling. A wider range of private placements of patients who are only slightly mentally disturbed outside the institutional walls of state hospitals will no doubt include the homes for the aged. A more scientific classification of the senile aged, as distinguished from the psychotic will result in a better understanding of the handling of this type of client. The out-patient clinics of the state hospitals will more and more serve as guiding agents. A more flexible interchange of residents between the homes for the aged and the state hospitals will relieve the homes of caring for patients who are beyond their facilities, while on the other hand the homes will have to take in patients who are not in need of the service which the state hospitals offer.

Summary

Modern trends in the care of the aged show an awareness of the elderly person's emotional as well as physical needs. These emotional needs are met, in part, by occupational and recreational programs which give the resident of the home a feeling of usefulness and independence. A solid foundation for adequate care is provided by continued research and specially trained personnel, not only administrators, physicians, nurses, and occupational and recreational directors, but also case workers who are essential in helping the elderly person make a successful adjustment.

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CURRENT COMMENT

Grants for Research on Aging

The National Institute of Health has established a Research Grants Division to administer the research grant program of the U. S. Public Health Service. To aid this program a number of Study Sections, each specializing in a particular field of medical research, has been created.

Gerontologists will be interested to learn that a Gerontology Study Section has recently been appointed. It has two functions, the first of which is to review applications for research grants in the field of Gerontology. In accordance with this responsibility, members of the Study Section will be glad to discuss research projects with prospective applicants.

The second function of the Gerontology Study Section is to survey the status of research in this field. The members of the Study Section would greatly appreciate receiving information under the following headings:

1. Present research related to Gerontology.
2. Contemplated research (whether or not grants will be sought from the National Institute of Health).
3. Institutions in a position to conduct research on aging.
4. Individuals wishing to conduct research on aging (whether at their present institutions or elsewhere).

The Executive Secretary of the Gerontology Study Section is Nathan W. Shock, Baltimore City Hospitals, Baltimore 24, Maryland.

Longevity of Women Physicians

Statistics show that women physicians are remarkably long lived. From obituary columns it was found that of 1,776 women physicians more than 180 lived beyond the age of 70; more than 112 lived to 80 years and over; more than 65 of the total number lived beyond 90 years, and there were a few that reached the century mark. Of the 29 former presidents of the American Medical Women's Association, 18 are still living and 3 had not reached the half-century mark when they became president. Thirteen of the ex-presidents were in the sixth decade when they took office.

"A record of fifty years in medical practice is not unusual for women physicians," says Dr. Elizabeth Bass in an article which appeared in *Opportunities for Medical Women*. She suggests that the significance of this finding possibly may be that women possess an inherent desire to alleviate suf-

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The hieroglyphics, "The Beginning of the Book for Transforming an Old Man into a Youth," at the top of this editorial page, are from the Edwin Smith Surgical Papyrus, translated by Professor John Breasted, University of Chicago Press.

fering and that devotion to duty and to humanity promotes a happier, perhaps even a longer span of life.

Trend Toward Older Leaders in All Fields

America's present-day leaders—legislative, judicial, diplomatic, military, naval, religious, and educational— are found to be definitely older now than formerly, according to a study by Dr. Harvey C. Lehman of Ohio University published in the *American Journal of Sociology*. Also, the leaders are more nearly the same ages, in their respective fields, than formerly.

In the past hundred years, ages of congressmen have risen from 35-39 to 55-59, and senators from 45-49 to 60-64. The first 26 Supreme Court justices at the time of appointment were 48. In modern times the appointment age rose to 56. Cabinet members' ages have risen in more than a century by about 14 years, to age 60. American diplomats averaged 42 years of age in 1800; now the average age is 60. Presidents of colleges and universities, before 1800, had a mean age of 49; from 1850 to 1899 this age rose to 57 years.

The 151 popes prior to 1525 were men of 60. The nine popes from 1800 to 1945 averaged 72. Protestant bishops in the United States before 1850 averaged 56. From 1875 to 1900 the ages were 60.

Top generals of the American Revolution and the War of 1812 averaged 39. In the Civil War the figure was 48, both sides included. In World War II it rose to 58. For 18 naval leaders of the Revolution, the War of 1812 and the war with Tripoli, the age was 36. In 1944 for 30 admirals and vice-admirals of World War II, the age was 59.

The trend to older leaders appears in other parts of the world as well. In England prime ministers from 920 to 1720 were 50. From 1834 to 1945 the age was 64. Among the world's hereditary rulers 137 up to 1800 were 37. Since then 104 of them averaged 45. Dr. Lehman suggests this increase may be partly explained by decrease in the number of assassinations.

On the other hand, for presidents of religious organizations there has been a decrease in age. Before 1850 this age was 68 and from 1875 to 1900 dropped to 61. Social unrest, Dr. Lehman believes may produce younger leaders, and new groups are likely to be younger. An example is the C.I.O. with leaders of 42, while the A.F.L. leaders average 55.

The reasons for the increased ages in most fields are not altogether clear. One suggestion he advances is that when the United States was younger, the number of potential elderly leaders was relatively small. Another suggestion is the complacency hypothesis, which proposes that a relatively satisfied group of people fears a sudden or radical change, such as young leaders might be more apt to initiate.

British Plans for Homes for Old People

The percentage of people over sixty-five in Great Britain is even greater than in the United States. In 1900 there were one and three-quarter million; in 1931 there were over three million, forming 7.2 per cent of the total population. Because of the appreciable increase in the expectation of life, it is estimated 12 per cent of the population will be eligible for old age pensions by 1950. According to the Beveridge Report, by 1971, if present trends continue, over 20 per cent of the population will be either women over sixty or men over sixty-five.

This is in contrast to 4.3 per cent of people sixty-five and over in the United States in 1900, 5.5 per cent in 1930, 7.2 per cent in 1945, an estimated 11.6 per cent in 1980, and an estimated 13.2 in 2000 (figures on the United States population from "The Aging Population" in the December, 1946, *Fortune*).

The changing trend in the population emphasizes the need for a national policy for the provision of suitable housing for the aged, according to *The Builder*, an English magazine which devoted its March 14, 1947, issue to describing various undertakings.

"On the Continent special flats for old people have been a feature of housing projects for some years. But in Great Britain, apart from almshouses, institutions and the dower houses of some country estates, regard for the needs of the elderly has been markedly limited until comparatively recently."

Aware of the undesirable features of life in an institution, emphasis has been placed on individual dwellings consisting of "a living room, one or more bedrooms, a kitchen-cum-scullery, larder, bathroom, w. c., and fuel store" planned in narrow rows to afford the maximum of sunshine and cross-ventilation. Except for the remodeling of existing premises, it is not regarded as desirable that buildings should have more than two floors. Elevators are not considered advisable, since if an older person is not accustomed to one, he will not use it. One floor dwellings take up too much space in urban sites, but it is felt that a fair proportion of the occupants will be physically capable of walking to the second floor. Low running costs for the homes are essential, because most old people have but slender means. It is recommended that the location chosen for the buildings be convenient to shops, library, church, post office, and bus routes.

In contrast to the simpler type of building, the proposed Isleden House will be a triangular-shaped building with a central courtyard. It will provide one and two room apartments for the aged on the first floor and family flats on the floors above. At one end of the base of the triangle are laundry and boiler-house, at the other, the administration block with provision for a sick ward and cafeteria, which can be used for general recreation room at other than mealtime. This is one of the few buildings where central heating is planned, and even this is to be supplemented by coal and gas fires.

Throughout the special needs of old and possibly infirm persons have been borne in mind. "The baths will be sunken into the floors 6 in., for easy access, and bars will be fixed on the walls above them to afford support when in use. The taps of the baths, basins and sinks will have large heads for easy turning; the handles of the doors will be lever type for easy operation; the window fastenings will be kept within easy reach, and the shelves in cupboards will be arranged at suitable heights for easy access; the paths outside the flats will be finished in 'Tarmac' to prevent them from becoming slippery. A proportion of the doors of the flats will be wide enough to admit invalid chairs."

The matter of mental and physical occupation as a means of combating senile deterioration has been carefully considered, and provision is made in the gardens, house, and laundry, for light occupation for the residents.

Unique Pension System in Colorado

Colorado has a pension law which is more liberal and more rigid than any in the United States. The so-called jackpot provision in the state constitution compels the Welfare Board of the state to divide up among pensioners all money left in the pension fund on December 31 of every year. Moreover, the division is pro rata, which means that a pensioner could be on the rolls for less than $1.00 monthly, or have gone on the rolls just the day before the year ended and still be eligible for a full share of the cut. In 1946 the pension fund's share of revenues brought the year end surplus to $9,358,296, which was divided among 42,385 pensioners, who averaged about $59 monthly. The State Assembly is considering ways of increasing monthly payments, and figures which would bring the income of a married pair

to $1800 a year have been mentioned. This would be even higher, if the family is considered as a unit, than California's seemingly Utopian plan of $30 every Thursday, says Roscoe Flemming in the *St. Louis Post-Dispatch*.

The revenue for pensions comes chiefly from two sources—85 per cent of all receipts from the state's 2 per cent sales tax and 85 per cent of all liquor license and tax revenues. The repeal of any source of revenue for the old age pension is forbidden unless another as good or better shall first have been provided. As a result, certain social institutions are fixed forever—the liquor industry, for example. Unless the Assembly can go out and find $4,000,000 yearly to replace liquor's contribution to old age pensions, the liquor industry is safe from repeal or drastic legislation.

These liberal provisions and their rigid safe-guarding have added to the peace and dignity of old age in Colorado and has given more prestige and power to the senior citizens of the commonwealth. However, the pension system has cramped all other state activities and has become the key to state politics and economics. Everything must conform to the legal requirements of the pension fund. Pensions in 1947 will cost about $29,000,000—including the January jackpot—or about 30 per cent of the state's revenue and more than the education of its 200,000 children. The state will spend three times as much on pensions as on highways; four times as much as on unemployment compensation; eight times as much as on all other relief subjects put together. Pensions will cost twenty times as much as public health—and Colorado has a higher death rate than any surrounding state.

In 1946 it was proposed to the voters that the jackpot be abolished and accrued moneys be held in a pension reserve for bad years. This was voted down nearly two-to-one last November. "The old people are now a pressure bloc intent on their own advantage and incapable of being swayed, apparently, by claims that the law is crippling other necessary functions of the state government. They say that the pension is little enough, in these times, and hardly constitutes affluence. Opponents of the present rigid pension law might admit that but at the same time would contend that the state's services should be apportioned equally and that benefits should be improved for all groups who need them rather than centered on one."

Lien and Recovery Legislation in Missouri

The Missouri Public Expenditure Survey, an organization devoted to furthering economical efficiency in government, has urged the adoption of lien and recovery legislation in order to deter those not in need from getting on the pension rolls and thereby provide more funds for the aged actually in need, C. A. Betts reports in the *St. Louis Post-Dispatch*.

A lien and recovery act removes the limitation on the amount of property one may own to be eligible for a pension, but it places a lien on the property for recovery by the state up to the amount paid in pensions to the property owner. A pensioner, or the surviving wife or husband, would remain in possession of his property for life; only after death would the state enforce its lien.

Since September 1945 pension rolls have increased in Missouri at the rate of 6,600 a year, and if they continue to expand at that rate, there will probably be 125,000 pensioners by July 1, 1949. This increase has progressed notwithstanding the benefits derived under the federal old age benefit system. The annual expenditures in the state for old age pensions has risen from $4,000,000 in 1936 to $40,000,000 estimated for the present fiscal year, including both state and federal funds, which means that a larger proportion of the state's revenues goes for old age pensions than for any other purpose except education. Only three states, Oklahoma, Colorado, and Washington have a higher percentage of the popula-

tion on the pension rolls than Missouri, where 2.87 per cent of the population is receiving pensions.

Experience in other states has been that with lien and recovery acts in effect, the heirs of aged persons preferred to take care of them rather than fail to inherit their property, and that thousands of applicants for pensions withdrew their applications rather than have liens placed on their property. The amounts recovered in other states exceeded the total cost of administration of old age pension systems of those states. Based on the experience of other states, Missouri would have recovered $1,300,000 in 1944 had the proposed law been in effect.

American Museum of Health

The American Museum of Health, whose activities were seriously curtailed by the war, is now looking forward to a greatly expanded program consisting of:

1. Three dimensional graphic condensations to portray facts and lessons to the large number of people who do no serious reading on science and health subjects;

2. Instruction in physiologic and medical facts by physician specialists so that the public understands and cooperates in reducing death rates and extending life and health;

3. Graphic exhibits kept to practical sizes for showing in schools, libraries, health centers, and made in quantities of each subject to reduce unit and per capita costs; and

4. Constant examination of museum techniques through audience reaction, studies, and other research, with consideration of the utilization of radio, newspapers, magazines, motion pictures, and other similar media.

While waiting to find a building in which to establish the Museum's public exhibits, the International Institute of Health Education was formed so that some progress might be made toward their basic objectives through concentration on nonexhibit activites under the auspices of a separate but closely related corporation. The program of the Institute includes research in health education methods, the development of tested aids for health education, and the training of health educators.

During the war years the field of health education has grown enormously. The present demand for qualified health educators far outstrips the supply as well as the Museum's capacity for up-to-date training. The need for and the possibilities of service of a central authoritative institution devoted to health education is greater than ever before. The members of the American Museum of Health do not think of the Museum as a collection of exhibits, but consider the exhibits the nucleus around which to construct a body of research, experiment, demonstration, teaching, and testing to guide the evolution of their science. Their program calls for concerted cooperation and support from all those who are involved with improving the health of the public—individuals, official agencies, or voluntary agencies concerned with special problems, according to the Acting President, Richard S. Childs.

Social Security

Extension of federal old age and survivors insurance to all gainful workers, increase in benefit amounts, and expansion of the program to include permanent total disability insurance, were recommended by the Social Security Board in its Eleventh Annual Report submitted to Congress in February. The proposed changes include:

Increase of benefit amounts, particularly for low-paid workers, and an increase from $3,000 to $3,600 a year in the maximum amount of earnings that are subject to contribution and counted in computation of benefits.

Increase in the amount of earnings from the present $14.99 a month which a bene-

ficiary may receive in covered employment without suspension of benefits.

Reduction of the qualifying age for all women beneficiaries from 65 to 60 years.

Adoption of a long-range plan for financing old age and survivors insurance that looks toward an eventual tripartite division of costs among employers, employees, and the federal government.

Deletion of or increase in the amount of the federal matching maximums for individual payments for old age assistance.

Abolition of state residence and citizenship requirements as a condition of eligibility for assistance in state plans approved under the Social Security Act.

Notes and News

Appointments—Dr. Albert I. Lansing and Dr. Nathan W. Shock have accepted appointments as assistant editors of the JOURNAL OF GERONTOLOGY. Dr. Lansing is assistant professor of Anatomy, Washington University Medical School, St. Louis, and Dr. Shock is chief of the Section on Gerontology of the National Institute of Health, United States Public Health Service.

Deaths—Dr. H. S. Jennings, University of California at Los Angeles, died April 14, 1947, at the age of seventy-nine. He was professor emeritus of zoology at Johns Hopkins University and research associate at the University of California until the time of his death. Dr. Jennings has made outstanding contributions to the field of behavior and genetics of protozoa, and was one of the pioneers in experimenting on the aging of lower organisms.

Meetings—The Gerontology Study Section, National Institute of Health, met in Washington, D. C., May 9, 1947.

The annual meeting of the American Geriatrics Society was held at Hotel Brighton in Atlantic City June 5, 6, and 7, 1947.

Positions Open—A case worker (medical social worker is preferred) is needed by the Montefiore Home for the Aged for psychiatric case work supervision and psychiatric consultation. Dr. Julius Weil, executive director of the Home, indicates that an excellent salary is available, and requests that applicants contact the Social Service Department of the Montefiore Home, 3151 Mayfield Road, Cleveland Heights, 18, Ohio.

In addition to editorial material placed in this section, the JOURNAL OF GERONTOLOGY will accept notices of positions open.

ORGANIZATION section

ROY G. HOSKINS, *President*
25 Shattuck St.
Boston 15, Massachusetts

HENRY S. SIMMS, *Secretary*
630 W. 168th St.
New York, New York

ROBERT A. MOORE, *Treasurer*
507 S. Euclid Ave.
St. Louis 10, Missouri

LAWRENCE K. FRANK, *President-Elect*
72 Perry St.
New York 4, New York

Minutes of the Second Annual Meeting of the Members of the Corporation of the Gerontological Society, Inc.

The meeting was called to order at 4:00 P.M. on February 2, 1947, in Room 931 at the Hotel Commodore, Forty-second Street and Lexington Avenue, New York City.

Present in person were Joseph C. Aub, Earl T. Engle, Lawrence W. Frank, William deB. MacNider, Robert A. Moore, Henry S. Simms, and Edward J. Stieglitz.

Present by Proxy were Walter C. Bauer, Roy G. Hoskins, and Ernest Miles.

Absent was E. V. Cowdry.

Those present in person and by proxy constituted a quorum for the transaction of business. Mr. Frank, the President-elect, acted as Chairman of the Meeting in the absence of the President. Dr. Simms acted as Secretary of the Meeting.

The Secretary presented proxies for Drs. Bauer, Hoskins, and Miles. These were accepted and ordered filed with the minutes of the meeting. The Secretary presented a certified copy of the Notice of the Meeting and this was ordered filed with the minutes of the meeting.

The minutes of the First Annual Meeting were read and approved.

The Chairman pointed out that the term of office of the following members of the Corporation, and of the Council, has expired:

ROY G. HOSKINS (as President)
WALTER C. BAUER
EARL T. ENGLE

and that two vacancies exist in the General Section. Dr. Joseph C. Aub was nominated to be President-elect. Dr. Ephraim Shorr was nominated to take the place of Dr. Joseph C. Aub, in the Medical Research Section, for the remaining two years of his term. Dr. Walter Bauer was nominated to succeed himself for a term of three years. Dr. Nathan W. Shock was nominated to represent Biological Research for a term of three years in place of Dr. Earl T. Engle. In the General Section, Dr. William Malamud was nominated for a term of three years, and Dr. Ernest Burgess for a term of one year.

Dr. Moore presented a report of the Corporation. By unanimous vote this report was approved and a summary was ordered filed with the minutes.

There being no other business upon motion duly made, seconded, and carried, the meeting was adjourned.

HENRY S. SIMMS, Secretary

Minutes of the Second Annual Meeting of the Council of the Gerontological Society, Inc.

The meeting was called to order at 4:45 P.M. on February 2, 1947, in Room 931 at the Hotel Commodore, Forty-second Street and Lexington Avenue, New York City.

Present in person were Joseph C. Aub, Earl T Engle, Lawrence W. Frank, William deB. MacNider, Robert A. Moore, Henry S. Simms, and Edward J Stieglitz.

Absent were Walter C. Bauer, E. V. Cowdry, Roy G. Hoskins, and Ernest Miles.

The minutes of the First Annual Meeting of the Council were read and approved.

The Treasurer presented the following report of the Corporation, duly signed and witnessed. This was unanimously approved and was ordered filed with the minutes of the meeting.

GERONTOLOGICAL SOCIETY, INCORPORATED

MEMBERSHIP ACCOUNT
FINANCIAL STATEMENT

Checks No. 1 through 24, Jan. 1, 1946—Dec. 31, 1946

INCOME

Dues paid by 23 members of Club for Research on Ageing (dues include subscription to JOURNAL)	$230.00	
Dues paid by 65 new members (dues include subscription to JOURNAL)	650.53	
Dues paid by 6 new members (subscription price previously paid to Thomas)	24.00	
Gift of Dr. Adrianus Pijper	1.10	
Dues for 1947 paid by 1 new member and 1 old member	20.00	
		$925.63

EXPENSES

Subscription price sent to Thomas for 82 new members (Checks No, 1, 3, 4, 6, 8, 10, 12, 13, 15, 16, 20, 21, 22)	$493.00	
Subscription price refunded to 6 new members who had paid twice (Checks No. 9, 11, 14, 17, 18, 19)	36.00	
Subscription sent to Thomas for 1 new member and 1 old member for 1947 (Check No. 24)	12.00	
Stationery and envelopes (Checks No. 2, 5, 23)	90.20	
Membership forms (Check No. 7)	26.01	
Bank charges on Canadian check	.78	
		$657.99
Bank Balance as of Dec. 31		247.64
Checks to be deposited, Dec. 31		20.00
		$925.63

EDITORIAL OFFICE ACCOUNT
FINANCIAL STATEMENT

Checks No. 32 through 87, Feb. 15 through Dec. 31, 1946

INCOME

Balance Feb. 15, 1946 from Josiah Macy, Jr. Foundation grant of $4000 for 1945–1946	$1872.21	
Grant from Josiah Macy, Jr. Foundation for 1946–1947	4000.00	
		$5872.21

EXPENSES

Salaries in Editorial Office		
Margaret Bronson (Feb. 1–June 30) Checks No. 32, 34, 43, 47, 48	$704.35	
Rita Noah (Feb. 1–Dec. 31) Checks No. 33, 35, 36, 42, 46, 54, 63, 65, 67, 76, 79, 86	1035.41	
Taxes		
Taxes withheld and remitted from salaries. Checks No. 37, 60, 70	131.20	
Social Security remitted (one-half withheld from employee's salary, one-		

half paid by Society) Check No. 38	13.90
City of St. Louis income tax withheld and remitted. Check No. 69.	.56
S.S.I.A. tax owed for 9/30/45–12/31/45	2.05
Translations of Abstracts	
French (Mrs. David Walsh)—Checks No. 40, 58	21.40
Spanish (Alfred Canton)—Check No. 41	15.40
Russian (American Russian Institute, International Press)—Checks No. 45, 52	136.00
Expense in Editorial Office	
Typewriter rental—Checks No. 39, 56, 59 73	33.75
Scientific Monthly, for copy of magazine Check No. 44	.50
Miscellaneous expenses, Washington University Checks No. 50, 84	38.50
Stamps—Checks No. 51, 57, 62, 64, 68, 74, 78	36.00
Accounting books—Check No. 61	5.21
Books—Checks No. 80, 82	7.31
Supplies (paper, carbon, manila folders, etc.) Checks No. 66, 67	15.90
Envelopes (Eden Publishing Co.) Check No. 87	29.32
Travel	
Dr. R. A. Moore—Check No. 53	39.87
Cost of JOURNAL borne by Society	
Thomas Publishing Co. for excess illustrations—Checks No. 49, 75, 83	187.90
Thomas Publishing Co. for advertising campaign for Supplement—Checks No. 71, 81	158.85
Banta Publishing Co. for April, July, Oct. issues of Supplement—Checks No. 72, 85	1337.36
	$3950.74
Bank balance as of Dec. 31, 1946	1921.47
	$5872.21

On Nov. 7, 1946, the Gerontological Society, Inc. was declared by the Commissioner of Internal Revenue to be exempt from federal income tax.

ROBERT A. MOORE, Treasurer

The Secretary presented a joint report of the Secretary and of the Membership Committee. This was approved and ordered filed with the minutes.

Dr. Moore presented the following report of the Editor of the JOURNAL OF GERONTOLOGY. After some discussion, this report was unanimously approved and was ordered filed with the minutes.

In the spring of 1945 when the decision to establish the JOURNAL OF GERONTOLOGY was made by the members of the Gerontological Society, two objectives were outlined:

(1) to publish a multidiscipline Journal and include all areas of knowledge as they relate to the processes of aging and the care of the aged, and

(2) to attempt a new type of scientific journalism for the laity in the form of a nontechnical supplement.

After discussion with the committee on publication and the officers of the Josiah Macy, Jr. Foundation, it was agreed that my assumption of the editorship was conditional on provision of sufficient secretarial assistance not only to edit the JOURNAL, but also to make up in part for the time I gave to the JOURNAL.

In the intervening two years the two objectives have been attained, but only at the expense of the personal condition imposed for acceptance of the position as editor.

The first volume of the JOURNAL has been completed with publication of 36 original papers and other editorial material. The technical JOURNAL had a total of 498 pages and the nontechnical of 238 pages. The areas of knowledge covered by the papers were:

Biologic sciences	22
Social sciences	8
Humanities	2
General	4

All papers with one exception have been abstracted and rewritten for the nontechnical supplement.

Eleven papers were submitted to the JOURNAL, while 25 were solicited by the editor. Seventeen of the 25 solicited papers were written on request. In other words, almost half of all papers published would probably not have been written if the JOURNAL were not in existence. The first number of volume 2 will have 8 papers and there are now only 2 papers in the editorial office for the April, 1947, number. Finally, 7 of the 36 papers were written by the 20 men who made the decision to establish a journal. Three others have promised something but have either not submitted the paper or have asked for more time.

These facts raise the question of whether or not the JOURNAL was launched prematurely. Restated, the question is: Is there sufficient investigation today in the broad field of gerontology to support a journal. It is my own belief that there is, and therefore we should continue publication.

A related question concerns the consumer in contrast with the supplier: Is there a demonstrated consumer demand for a journal of gerontology. It is with great satisfaction that I report the financial status of the JOURNAL for the first year. The publication costs were covered by income from 960 subscriptions and advertising. In other words, exclusive of promotional and publishing fees, the JOURNAL broke even the first year. These latter costs amounted to about $2,700.

Despite the optimistic report on the first year, there is serious doubt in the minds of some that the subscription list can be held for succeeding years under the present editorial policy. Full discussion of this point will be given later.

Other statistics on the editorial make-up of volume 1 according to sections are:

	Technical	*Nontechnical*
Current Comment	43 items	22 items
Book Reviews	16 books	9 books
Gerontologic Reviews	18 topics	—
Legal Section	11 pages	—
Organization Section	21 pages	3 pages
Index of Literature	12 pages	—
Glossary	—	17 pages

So much for the satisfactory part of the report. Now, for the unsatisfactory. Even before the first number of the JOURNAL appeared, doubt arose in the minds of some about the financial stability of the nontechnical supplement. A special meeting of the committee on publication was held in New York in May, 1946. The request of the publisher that he be relieved of the manufacturing and promotional costs of the supplement was acceded to, and it was decided to pay these charges from funds in the editorial office. This has taken about $1,500 for the year 1946. The net result has been to make available to the editor only sufficient secretarial assistance for the Journal. I hasten to add that the action was determined on with my full endorsement since I wished to continue the supplement as an experiment in scientific journalism for the laity. However, I am unwilling to act as editor under these conditions for an indefinite period.

The fact that motivated the publisher in his request was a logical one; the subscription list for the supplement did not exceed 100. Thus, an income of $300 was in contrast with an outgo of over $1,600. During the first year the supplement was given free with subscriptions to the JOURNAL. This practice has been discontinued for volume 2, but the subscription list is still not too formidable.

After the costs of manufacturing and promotion of the supplement were assumed by the editorial office, a planned campaign of sales was undertaken. About 600 copies each of the April, July, and October numbers were sent gratis to public libraries, physicians in California and Florida, and homes for the aged respectively. The first two gave little return, but the publisher in-

formed me last week that the last (homes for the aged) was giving good results.

Early in December the publisher wrote me to the effect that he wished to be released from his contract with the society at the earliest date possible. I informed the committee on publication of this and had a conference with the publisher in mid-January. A preliminary survey indicates that at least two other medical publishers are interested. The type for volume 2, number 1 is set and will be held by Banta for a decision by the society.

The first question to be decided is:

(1) Does the society wish to continue publication of the JOURNAL or discontinue it for the present?

If the decision is to continue, then the second question is:

(2) Should the present editorial policy of a multi-discipline Journal be pursued, or should the JOURNAL be oriented to
(a) biology, or
(b) medicine?

A related question is:

(3) Should the supplement be continued and if so under what conditions?

Finally, the all-important question:

(4) How is the project to be financed?

I have refrained from any comment on these questions in order that you may be free to decide them without prejudice.

ROBERT A. MOORE

Dr. Moore pointed out that circumstances necessitated a change in the publishers of the JOURNAL. It was agreed that the Editor and the Publication Committee should use their judgment in making arrangements with another publisher.

It was moved by Dr. Stieglitz, and seconded by Dr. Engle, that the Council approve the principle of continued publication of a multidiscipline JOURNAL having the same general editorial policy as that of the present JOURNAL. After some discussion, the motion was unanimously carried.

Upon motion by Dr. Aub, duly seconded and carried, it was agreed that: the Publication Committee is authorized to continue to publish a non-technical journal, provided that it can be financed.

The opinion was expressed that such a non-technical journal should differ somewhat from the present "non-technical supplement."

It was voted to recommend that the Society defer the holding of a Scientific Meeting until 1948.

It was also voted that the Membership Dues for 1947 be $10.

The President was authorized to appoint a Publication Committee.

The following Membership Committee was appointed: Nathan W. Shock (Chairman), E. V. Cowdry, and Clive M. McCay.

There being no other business, the meeting was adjourned.

HENRY S. SIMMS, Secretary

Minutes of the Annual Business Meeting of the Gerontological Society, Inc.

The meeting was called to order in the Blue Room of the Hotel Beekman at 12:30 P.M. on February 4, 1947. Lawrence K. Frank served as Chairman and Henry S. Simms acted as Secretary of the Meeting. Eleven members of the Society were present. Robert A. Moore, Editor of the JOURNAL OF GERONTOLOGY, presented a report in which it was pointed out that circumstances necessitated a change in the publishers of the JOURNAL. He stated that Williams and Wilkins might be interested in taking over the publication, but not before January, 1948. He also reported that Paul B. Hoeber, Inc. exhibited some interest, particularly if given a sufficient guarantee.

Upon motion duly made, seconded, and carried, the Editor was authorized to publish the JOURNAL in the name of the Society

or to negotiate and to sign a contract with a new publisher.

It was also moved that the Editor be authorized to negotiate with the Josiah Macy, Jr. Foundation for renewed financial support in connection with publication of the JOURNAL.

Upon motion duly made, seconded, and carried, it was decided that publication of the supplement be temporarily suspended. It was also decided that samples of the main JOURNAL should be sent to subscribers of the supplement in order to give them an opportunity to decide whether they wish to subscribe to the JOURNAL.

In accordance with the nominations for officers which had been made at the Meeting of the Members of the Corporation on February 2, 1947, the following officers were elected to serve until the Annual Meeting in 1948:

Lawrence K. Frank	President
Joseph C. Aub	President-elect
Robert A. Moore	Treasurer and Editor
Henry S. Simms	Secretary

The following Members of the Council were also elected to serve for the indicated number of years:

In the Medical Research Division, Dr. Ephraim Shorr (2 years); and Dr. Walter Bauer (3 years); in the Biological Division, Dr. Nathan W. Shock (3 years); in the General Division, Dr. W. E. Burgess (1 year), and Dr. William Malamud (3 years). The complete list of officers and other members of the Council is as follows:

President	Lawrence K. Frank
President-elect	Joseph C. Aub
Treasurer	Robert A. Moore
Editor	Robert A. Moore
Secretary	Henry S. Simms

Medical Research:	To Serve Until:
Edward J. Stieglitz	1948
Ephraim Shorr	1949
Walter Bauer	1950

Biologic Research:	
E. V. Cowdry	1948
William deB. MacNider	1949
Nathan W. Shock	1950

General:	
W. E. Burgess	1948
Walter R. Miles	1949
William Malamud	1950

The Chairman called attention to the fact that the Council had recommended that there should be no Scientific Meeting until 1948. Upon motion by Dr. Moore, duly seconded and carried, the President was authorized to appoint a Program Committee to make plans for a Scientific Meeting to be held in 1948.

Dr. Cowdry presented a letter from Dr. Korenchevsky in regard to the international relationship between organizations interested in gerontology. Dr. Cowdry reported that the Club for Research on Ageing had voted to discontinue its international relationships. Upon motion duly made, seconded, and carried, the Secretary was authorized to inform Dr. Korenchevsky that the Gerontological Society would be willing to become associated with accredited organizations in other countries having direct interest in the field of gerontology.

Upon motion duly made, seconded, and carried, the Membership Committee was authorized to print a descriptive folder or booklet to be used in order to give prospective members information concerning the aims and purposes of the Gerontological Society.

There being no other business upon motion duly made, seconded, and carried, the meeting was adjourned.

HENRY S. SIMMS, *Secretary*

Proceedings of Ninth Annual Meeting of the Club for Research on Ageing—American Division

Hotel Beekman, New York City, Feb. 3 and 4, 1947

MONDAY, 9:30 A.M.

1. F. Fremont-Smith
   Introductory remarks
2. G. B. Wislocki
   How Can Methods of Histochemistry and Chemical Histology Be Best Utilized in the Study of Aging?
3. H. S. Simms
   Why Does the Mortality Rate from Almost Every Disease Increase with Advancing Age at a Progressively Accelerated Rate?
4. R. G. Harrison
   Aging Processes as Seen by an Embryologist

MONDAY, 2:00 P.M.

1. E. J. Stieglitz
   What Is Being Done to Improve Techniques for the Clinical Evaluation of Functional Reserves?
2. E. T. Engle
   What Are Causes of Tubular Fibroses in Advancing Years?

MONDAY, 7:00 P.M.

1. N. W. Shock
   Program of Newly Established Section on Gerontology of the National Institute of Health

TUESDAY, 9:30 A.M.

1. A. I. Lansing (Introduced by E. V. Cowdry)
   Do Offspring of Young Parents Have Longer Life Span than Offspring of Old Parents?

TUESDAY, 2:00 P.M.

1. Business Session

TUESDAY, 3:00 P.M.

1. Gerontological Society

The United States Public Health Service—Baltimore City Hospitals Research Section on Gerontology

N. W. SHOCK

SINCE its inception, the United States Public Health Service has placed great emphasis on preventive medicine and research. Because of our maturing population, research on gerontology represents a logical extension of this policy of preventive medicine.

The active interest of the National Institute of Health in the problems of aging was stimulated by an invitation to the former Director of the Institute, Dr. L. R. Thompson, to attend a meeting of the Club for Research on Ageing in January 1940. Following this meeting a financial grant was generously made by the Macy Foundation to support a specialist in gerontology for one year. On the basis of this grant a Unit on Gerontology was officially established in the National Institute of Health as a part of the Division of Physiology. In July, 1940, Dr. Edward J. Stieglitz was placed in charge. Through the efforts of Dr. Stieglitz arrangements were made with the Department of Public Welfare of Baltimore for a research laboratory to be established in the City Hospitals there. In December, 1940, a laboratory technician was employed by the Public Health Service, and a study of uric acid excretion in aged subjects (1) was begun under the supervision of Dr. Stieglitz assisted by members of the Hospital Staff. Dr. Stieglitz also conducted a survey of studies in gerontology which were then in operation or being planned in university laboratories throughout the country (2).

In July, 1941, the grant from the Macy Foundation expired and full financial support of the program was assumed by the United States Public Health Service. At this time Dr. Stieglitz left to resume the private practice of medicine, and Dr. Nathan W. Shock, Assistant Professor of Physiology at the University of California Medical School, was appointed Chief of the Unit. Studies on the effect of aging on kidney function (3) were begun at this time.

During the war years, 1943 to 1945, the aging studies were suspended, and the Unit's time was devoted to problems more closely related to the war effort (4–9).

In July, 1946, the Public Health Service provided a greatly increased research budget and raised the status of the Unit to that of a Section. The increased budget provided money for expansion of both staff and equipment which required greatly augmented physical facilities for the activities of the Section. The Baltimore City Hospitals generously supported the Section by making available one entire wing of the Chronic Hospital for research laboratories. The Hospital made all the necessary structural alterations in the building and provided all necessary laboratory furniture.

The staff of the Section on Gerontology has been expanded to include three physicians, one biochemist, one psychologist, one physiologist, and ten laboratory technicians. Qualified members of the Section hold visiting appointments on the hospital staff, and qualified members of the House Staff of the Hospital are provided research facilities in the laboratories of the Section.

A research program in gerontology has been drawn up and approved by the Surgeon General and the Federal Security Agency. Ultimate organizational development of the Section calls for six administra-

tive and seven operational departments as follows:

Office of the Chief will direct and coordinate all activities of the Unit.

Advisory Board, composed of specialists in different scientific disciplines, will serve in an advisory capacity to the Chief upon his request.

Administrative and Statistical Unit will furnish all necessary clerical computations and statistical services required by the operating research units.

Patient Selection and Control Unit will coordinate requests for subject material from operating research units and will select patients suitable for specific tests and studies from the hospital, infirmary, and out-patient groups. It will also maintain complete clinical records of all patients This unit will have two subdivisions:

Out-Patient Groups will work through the Baltimore Department of Public Welfare and other local groups and institutions for the arrangement of all necessary details of contact, appointments, transportation, admission, and discharge of aged individuals in the community who volunteer to participate in the test program.

Institutional Groups will be responsible for the medical care and supervision of all patients on the research ward of the Baltimore City Hospitals and for carrying out the programs outlined by the research units.

Operating Research Units

Geriatrics will study the causes and treatments of diseases of the aged and aging, especially heart disease, hypertension, and arteriosclerosis.

Structural Changes will deal with the structural changes in organisms associated with aging, with special attention to the heart and blood vessels.

Biochemistry will probe the effect of aging on biochemical changes in cells and tissues.

Biophysics will study the age changes in biophysical properties of cells and tissue, including studies on cardiac output, changes in heart size and function.

Physiology will study the effects of aging on the functional and reserve capacities of each organ system of the body as well as the effects of aging on integration between the systems, especially the effect of aging on the heart, blood vessels, and kidneys.

Psychology will attempt to learn the effects of aging on the mental and psychologic functions.

Socio-Economic Problems will study the epidemiology of aging; the present and projected medical and hospital needs of the aged; the methods and facilities available and needed for the care of the aged; the employability, employment potentialities, and employment opportunities for the aged; methods of adult education; and education for the retired group among the aged.

Research studies now under way in the laboratory include: the effect of age on kidney function, cardiovascular changes with age, the physiologic aspects of heart failure in older persons, age changes in sensory capacities, and the effect of age on metabolic recovery after exercise.

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LEGAL ASPECTS

GOVERNORS' MESSAGES

Excerpts of governors' messages prepared by the Law and Legislative Reference Section of the Social Security Administration Library revealed that most of the state governors in their messages stressed the importance of increasing old age assistance payments.

The Governor of Colorado recommended that pensions be not less than $45 per month. Most of the Governors, however, were concerned with increasing the maximum rather than providing a minimum. Arizona had increased the maximum to $50, but the Governor considered this insufficient. The Governor of Connecticut felt that the present maximum of $40 does not provide the help it did when this figure was voted in 1941, and pointed out that half of an increase of $5.00 would come from federal funds. Delaware's Governor asked that the amount be increased from $30 to $40. The Governor of Indiana stated that because of the increased cost of living, it has been necessary to raise the amount of awards to recipients of old age assistance, and further requested that the maximum of $40 per month be increased immediately to $45 in order to comply with recent federal legislation.

The Governor of Minnesota asked that the present maximum of $40 either be raised or eliminated, and that, if a maximum is retained, county welfare boards be required to grant supplemental assistance from county funds in special hardship cases. In Montana the average monthly allowances to the aged grew from $19.46 in January, 1941, to $36.90 in December, 1946; the Governor requested that the legislature examine the possibility of enlarging upon this aid. The Governor of South Carolina suggested the elimination of the statutory maximum for old age assistance, and Oklahoma's Governor said that while Oklahoma had not reached the maximum authorized by federal law, it is a goal toward which they should work.

Some of the Governors, however, were satisfied with present pensions. New Hampshire's Governor stated that New Hampshire has established a nation-wide reputation for the adequacy of its efforts to assist its aged and that the State had, in the past two years, increased its assistance standards to conform to the new conditions arising out of increased costs of living. "The lack of complaints reaching the Governor's office," he said, "is an indication that these programs are meeting the needs of the people in accordance with our determination that our people shall live in health and decency." The Governor of New Jersey felt that they had already achieved a substantial measure of security against the hazards of dependent old age. The Governor of Illinois said that through foresighted legislation enacted two years ago the old age pension grants recently were increased to a maximum of $50 a month; these payments now are higher than they have ever been in keeping with the higher level of living costs.

The Governor of New Mexico asserted that their Public Welfare Department, in cooperation with the federal government, has developed an extensive program and that aid for dependent aged has been wisely employed to serve a useful social purpose as well as an economic one. The Governor of Oregon said that although old age assistance payments in Oregon now average approximately $45, the payments cannot be defined as lavish in view of present day costs, but that it is a record of which Oregon can be justly proud. Only a moderate increase in appropriations for the ensuing two year period was requested by the Governor of Wyoming because of increase in the last two years in the average grants of old age assistance which has advanced Wyoming from twenty-first to fifth position among the forty-eight states of the Union in amount of average grants.

Many of the Governors anticipated an increasing number of old age assistance payments. The Governor of Connecticut said that the number of the aged is increasing and their hospitals and institutions are too crowded to care for them adequately. "The old time Town Farm," he said, "was a tragic solution." Arizona's Governor felt that the increase in the case load was bound to continue. With the close of the war, many elderly people who had been employed during the war years left their jobs and became recipients of old age assistance, said the Governor of Indiana. Massachusetts's Governor asserted that already there were signs that we must expect a large increase in the number of old age assistance cases. The Governor of Wyoming warned of an anticipated increased load which is sure to follow the unusual inflationary period which the country is now experiencing. On the other hand, New Hampshire's Governor thought that case loads have not increased sharply since the end of the war, although the cost per case has.

Increasing taxes or allocating greater appropriations for old age assistance funds was advocated in order to take care of the increased payments and number of cases. Connecticut's Governor said it would be necessary to increase the personal tax from $3 to $6 or that $5,600,000 would have to be transferred from the General Fund to the Old Age Assistance Fund to meet the needs for the next biennium. He also recommended a more equitable disposition of the tax proceeds so that towns can retain 3 per cent of the amount actually collected in reimbursement for the expense they incur in collecting the tax. Apportionment of additional sales tax funds to provide greater state aid and participation in providing for the aged was recommended by the Governor of Kansas. "The annual cost of old age assistance now exceeds $20,000,000" said the Governor of Massachusetts, "and while existing revenues appear sufficient for this program during the next fiscal year without recourse to an appropriation from the General Fund, it must be pointed out that this can be no more than a temporary situation." In North Carolina, too, it was felt that the increased cost of living makes it necessary to give further attention to the appropriation for the aged.

Opposed to diversion of any portion of sales tax now ear-marked for old age assistance and not favoring higher tax rates or new forms of taxation to accomplish this purpose, Oklahoma's Governor thought the key to liberalizing the treatment of aged citizens was in administrative economy. This he thought could be accomplished by consolidating all public welfare activities under one Commission, thereby relieving the general revenue fund of demands totaling approximately two million dollars for each of the next two years. The Governor of Vermont felt that economy would be effected by creating a Department of Institutions and a Department of Social Service in place of the present Public Welfare Department and Department of Old Age Assistance, since in the latter there are many case workers who cover the same area as is covered by case workers of the Department of Public Welfare. South Dakota's Governor required a deficiency appropriation for old age assistance in order to maintain the present payment levels during the remaining months of the present fiscal year.

Recommended by the Governor of Tennessee was that additional funds be made available and that the pro rata share of the counties participating in the program be reduced so that the state would contribute 40 per cent, the counties 10 per cent, and the federal government 50 per cent. Stabilization and reduction of the localities' share of the expenditures to not more than 20 per cent of the cost was effected in New York. Moreover, the costly, antiquated settlement system of determining locally the state and local responsibilities for welfare costs is abolished. The Governor of Washington estimated that the cost of carrying on their social security program will rise to $16,000,000 in the next biennium. The need for increased appropriations was stressed

by the Governor of West Virginia in view of the increased cost of food, clothing, and maintenance. "We must provide an amount sufficient not merely to sustain life, but to promote health and well being," he said.

By compliance with recent federal legislation which increased the maximum amount of benefits for the aged to $45 a month, the Governor of North Carolina as well as the Governor of Indiana expected to receive the full benefit of available federal funds. The latter further hoped that the federal law which provides that assistance cannot be paid to a recipient while an inmate of a public institution would be amended so that public institutions caring for the aged can receive a portion of the money paid to the recipient.

Colorado's well-known "jackpot" came into consideration with the Governor's request that provision be made for the equitable monthly division of excess state funds which under existing arrangements would accumulate for division only once each year. "Much confusion, disappointment, and bitterness on the part of old age assistance recipients is caused by the failure to recognize that, under our federal and state laws, assistance is granted on a basis of need and is not a pension received as a matter of right," said the Governor of Nebraska. "Unless a pension system is adopted similar to the retirement provisions of the federal social security program it will be necessary to have rules and regulations and case workers to determine the degree of need and administer the assistance program, which means there will continue to be some friction between those on the assistance roles and those who administer the law."

The problem of determining who should get old age assistance was also considered. The Governor of Connecticut recommended legislation to protect the home property of beneficiaries of old age assistance and that an exemption of at least $5,000 be granted to them. South Carolina's Governor recommended deletion of the restrictive income clause of $240 and the citizenship requirements for old age assistance.

The Governor of Utah recommended authorization of the taking of liens on the property of Public Welfare clients in an amount equal to the total sum of capital investments made by the state in said property. During the depression when the law was passed it was decided that as long as rent was provided for recipients of old age assistance who did not own their homes, those who did own them should not be penalized by having a lien placed for the amount of their grants. Now, however, there are 861 recipients of public assistance who own valuable property in addition to the homes in which they live. South Dakota recommended the repeal of the law providing that all recoveries from recipients of old age assistance, from estates of old age recipients, or from old age liens, except such portions payable to the federal government, be transferred to the general fund, and proposed an enactment making these recoveries available for matching and for payment of grants.

Homes for the aged were also commented upon. Montana's Governor recommended a separate institution for the aged who are not insane but who have been committed to the state hospital. West Virginia's institution at Sweet Springs was, in her Governor's judgment, a great success. There are still needs to be met, however, needs which apply with equal force to their home for the colored aged and infirm. Since the passage of the old age assistance act in Iowa, nursing homes which make a business of caring for those receiving old age assistance and other aged persons have greatly increased. The Governor estimated that there are at least 245 such nursing homes today in which thousands of aged people are living, and asked that some provision be made for the licensing and regulation of these institutions. "Aged citizens are entitled to the protection of the state from neglect or exploitation by the greedy," he said.

The following are extracts from the bul-

letins on state legislation, health and welfare, of the Social Security Board. Errors may occur in both bill numbers and titles.

ARIZONA

Old Age Assistance—H. 5. Reduces eligibility age for assistance from 65 years to 60 years. Introduced January 15.

H. 79. Provides that recipients must have resided in the State 15 years out of 20 years period. Introduced January 27.

H. 111. Relates to old age assistance. Introduced January 30, and referred to Judiciary Committee. Passed House February 13.

H.M. 3. Memorializes Congress to extend federal contributions for old age assistance beyond December 31, 1947, by making the provision for assistance a permanent part of the laws of the United States. Introduced February 3. Passed House February 25.

Public Assistance—HCR. 4. Proposes a state constitutional amendment exempting from taxation property of persons receiving state assistance under social security not exceeding $5,000. Introduced January 27.

ARKANSAS

Old Age and Disability Grants—H. 262. Makes appropriation up to $2,000,000 from Public Welfare Fund to increase amount available for old age and disability grants (unspecified portion of previous biennial appropriation of $4,000,000 allocated to such grants). Introduced February 11. Substituted by H. 281 in House February 11. Withdrawn in House February 11.

H. 281. (Substitute for H. 262) Makes appropriations from Public Welfare Fund of $1,000,000 for each of next two fiscal years, "for increasing the amount of funds available to pay old age and disability grants"; appropriates $1,500,000 annually or next biennium from federal funds which may be allocated hereafter to old age assistance, and aid for dependent children, crippled children, and the blind accounts; this money to be in addition to appropriations for "carrying out the duties of the State Department of Public Welfare." Introduced February 11, and referred to Budget Committee. Passed House February 17; passed Senate February 21. Approved March 3. Chapter no. 159.

Old Age Assistance—H. 370. Requires Public Welfare Department to take a lien on any property owned by applicant for old age assistance or applicant's spouse, individually or jointly, as condition of granting such assistance. Introduced February 21, and referred to General Welfare Committee. Withdrawn in House February 26.

CALIFORNIA

Old Age Pension—A. 138. Increases old age pension to $60. Introduced January 10, and referred to Social Welfare Committee.

Aged, Homes—A. 413. Adds to the Welfare and Institutions Code, Chapter 4 of Division 3, comprising Sections 2370 to 2374, inclusive, relating to the issuance by counties of bonds for the construction of homes for aged persons. Introduced January 16, and referred to Municipal and Civil Government Committee.

Old Age Assistance—A. 93. Amends Sections 2024 and 2186 of the Welfare and Institutions Code, relating to aid to the aged. Introduced January 10, and referred to Social Welfare Committee.

A. 124. Amends Sections 2011, 2160, and 2181; repeals Sections 2181.01 and 2224 of the Welfare and Institutions Code; amends Section 206 of the Civil Code and Section 270c of the Penal Code, relating to aid to the aged, and to the liability of responsible relatives. Introduced January 10, and referred to Social Welfare Committee.

A. 377. Adds Section on 2020.02 to the Welfare and Institutions Code, relating to aid to the aged. Introduced January 16, and referred to Social Welfare Committee.

A. 412. Strikes citizenship requirement from old age pension law. Introduced January 16, and referred to Social Welfare Committee.

A. 416. Adds Section 2163.3 to the Welfare and Institutions Code, relating to aid to the aged in respect to personal property qualifications of applicants and recipients. Introduced January 16, and referred to Social Welfare Committee.

A. 424. Amends Section 2160.5 of the Welfare and Institutions Code, relating to aid to the aged. Introduced January 17, and referred to Social Welfare Committee.

A. 426. Amends Section 2163 of the Welfare and Institutions Code, relating to personal property qualifications for aid to the aged. Introduced January 17, and referred to Social Welfare Committee.

A. 428. Amends Section 2183.9 of the Welfare and Institutions Code, relating to aid to the aged. Introduced January 17, and referred to Social Welfare Committee.

A. 453. Adds Section 2163.3 to the Welfare and Institutions Code, relating to aid to the aged, declaring rents not income. Introduced January 17, and referred to Social Welfare Committee.

A. 477. Increases old age pensions from $60 to $75 a month. Introduced January 20, and referred to Social Welfare Committee.

A. 478. Repeals Sections 2182 and 2224 of the Welfare and Institutions Code, relating to relative's responsibility to contribute to the support of recipients of aid-to-the-aged. Introduced January 20, and referred to Social Welfare Committee.

A. 572. Increases the old age pension to $75. Introduced January 21, and referred to Social Welfare Committee.

A. 606. Amends Section 2220 of the Welfare and Institutions Code, relating to suspension or revocation of grants of aid to aged persons. Introduced January 21, and referred to Social Welfare Committee.

A. 646. Amends Section 2165 of the Welfare and Institutions Code, relating to aid to the aged in respect to real property qualifications of applicants. Introduced January 22, and referred to Social Welfare Committee.

A. 751. Relates to aid to the aged; designates such aid as senior citizens' grants; increases the amount thereof; provides for funeral benefits and health services for recipients thereof; modifies property and income qualifications therefor; makes an appropriation. Introduced January 23, and referred to Social Welfare Committee.

A. 757. Amends Section 2160 of the Welfare and Institutions Code, relating to aid to the aged. Introduced January 23, and referred to Social Welfare Committee.

A. 1527. Adds Section 2186.1 to the Welfare and Institutions Code relating to aid to the aged. Introduced January 30, and referred to Social Welfare Committee.

A. 1520. Amends Section 2163, Welfare and Institutions Code, relating to aid to the aged. Introduced January 30, and referred to Social Welfare Committee.

AJR. 15. Memorializes the President and the Congress of the United States to make grants to this State for old age assistance to persons 60 years of age or older. Introduced January 23, and referred to Rules Committee.

AJR. 23. Relates to amending the Federal Social Security Act in respect to old age assistance. Introduced February 3, and referred to Rules Committee.

S. 37. Amends sections of the Welfare and Institutions Code, relating to aid to the aged, increasing the amount thereof; makes an appropriation. Introduced January 10, and referred to Welfare and Institutions Committee. Withdrawn and rereferred to Social Welfare Committee in Senate January 14.

S. 190. Amends Sections 2011, 2160, and 2181 of the Welfare and Institutions Code; repeals Sections 2181.01 and 2224 of said Code; amends Sections 206 of the Civil Code, and amends Section 270c of the Penal Code, relating to aid to the aged and liability of relatives. Introduced January 17, and referred to Social Welfare Committee.

S. 192. Amends Section 2016 of the Welfare and Institutions Code, relating to aid to the aged. Introduced January 17, referred to Social Welfare Committee.

S. 537. Adds Section 2165b to the Wel-

fare and Institutions Code, relating to aid to the aged. Introduced January 28, and referred to Social Welfare Committee.

S. 953. Amends Section 2020, Welfare and Institutions Code, relating to aid to the aged, increasing the amount thereof. Introduced January 31, and referred to Social Welfare Committee.

S. 1272. Relates to aid to the aged, designating such aid as senior citizens' grants; increases the amount thereof and provides funeral benefits and health services for recipients thereof; modifies property and income qualifications therefor; eliminates the liability of relatives to contribute to the support of recipients thereof and to make reimbursement therefor. Introduced February 4, and referred to Social Welfare Committee.

SCA. 7. Proposes an amendment to the Constitution, by adding Section 14 to Article XVI, relative to the responsibility of relatives of recipients of public assistance to contribute to their support. Introduced January 28, and referred to Social Welfare Committee.

COLORADO

Home for Aged—S. 254. Provides for the establishment of a state home for aged persons. Introduced January 14, and referred to Finance Committee.

Old Age Pensions—S. 27. Amends Sections 4 and 6, Chapter 201, Session Laws of Colorado, 1937, as amended, relative to the eligibility for pensions to the needy aged and the amount of pension which any applicant may receive. Introduced January 6.

S. 28. (Same as S. 27) Introduced January 6.

S. 90. Relates to old age pensions. Introduced January 9, and referred to State Affairs and Public Lands Committee. Amended in Senate February 4. Passed Senate February 5. Reported with amendment in House February 6. Passed House February 11. Approved February 11.

S. 93. Repeals Chapter 119, 1935 Colorado Statutes Annotated, relating to old age assistance. Introduced January 9, and referred to State Affairs and Public Lands Committee.

S. 115. (Same as H. 181) Relates to old age pensions and amends Section 4, Chapter 201, Session Laws of Colorado, 1937, as amended. Introduced January 9, and referred to State Affairs and Public Lands Committee.

S. 116. Lifts the $45 a month ceiling; provides a reserve contingent fund of $2 per pensioner or less, and restricts rent reductions from home owners on pension. Introduced January 9, and referred to State Affairs and Public Lands Committee.

S. 117. (Same as H. 182) Relates to old age pensions and amends Section 10, Chapter 119, Colorado Statutes annotated, 1935. Introduced January 9, and referred to State Affairs and Public Lands Committee.

S. 245. Amends Sections 4 and 6, Chapter 201, Session Laws of Colorado, 1937, relating to the eligibility for and amount of pensions to the needy aged. Introduced January 14, and referred to State Affairs and Public Lands Committee.

H. 1. (Same as S. 27) Introduced January 3, and referred to Judiciary Committee. Amended in House January 27. Passed House January 29.

H. 2. (Same as H. 1) Introduced January 3, and referred to Judiciary Committee. Amended in House January 27. Passed House January 29.

H. 99. Relates to pensions for aged persons in need, amending Chapter 201, Session Laws of Colorado, 1937, as amended in Section 1, Chapter 145, Session Laws of Colorado, 1943. Introduced January 6.

H. 181. (Same as S. 115) Introduced January 8, and referred to Judiciary Committee.

H. 182. (Same as S. 117) Introduced January 8, and referred to Judiciary Committee. Reported with amendment in House February 11. Passed House February 14.

H. 214. Relates to old age pensions. In-

troduced January 9, and referred to Judiciary Committee.

H. 313. (Same as S. 116) Introduced January 10, and referred to Judiciary Committee.

H. 314. (Same as S. 115) Introduced January 10, and referred to Judiciary Committee.

H. 315. (Same as S. 117) Introduced January 7; referred to Finance, Ways and Means Committee.

CONNECTICUT

Aged and Infirm—H. 962. Provides for an appropriation of $600,000 to establish institute for aged and infirm. Introduced February 10, and referred to Public Welfare and Humane Institutions Committee.

Old Age Assistance Tax—H. 351. Provides for exemption of veterans of World War I from making payment thereon. Introduced January 31, and referred to Finance Committee.

H. 493. Exempts veterans from payment of old age assistance tax. Introduced February 5, and referred to Finance Committee.

Old Age Assistance—S. 94. Provides for changing the maximum award from $40 to $55 and burial expenses from $100 to $150. Introduced January 29; referred to Judiciary Committee.

S. 254. Provides for abolishing the "means and needs test" laws which pauperize those applying for old age assistance benefits. Introduced February 5, and referred to Judiciary Committee.

S. 363. Proposes to eliminate some of the pauperisms from the "Assistance to the Aged" act. Introduced February 6.

S. 366. Provides for sufficient funds for the aged of this state receiving benefits under the "Assistance to the Aged" act. Introduced February 6, and referred to Judiciary Committee.

H. 38. Provides for an increase of old age assistance from $40 to $60 per month maximum. Introduced January 16, and referred to Public Welfare Committee.

H. 165. Provides for an exemption to World War I veterans similar to veterans of World War II as respects the old age assistance tax. Introduced January 28; referred to Finance Committee.

H. 372. Concerns old age assistance, releasing towns of some of their liability under the present statute which requires five continuous years residence. Introduced January 31, and referred to Judiciary Committee.

H. 672. Provides for limiting the claim of the state to the amount of estate in excess of $5,000. Introduced February 6, and referred to Judiciary Committee.

H. 673. Provides for making ineligible for old age assistance persons having an interest exceeding $5,000 in value in real property. Introduced February 6, and referred to Judiciary Committee.

H. 674. Provides for making the maximum benefit award under old age assistance $45 instead of $40 a month. Introduced February 6, and referred to Judiciary Committee.

H. 866. Provides that a beneficiary of old age assistance who dies shall not be buried at the expense of the state, if the beneficiary had adequate life insurance. Introduced February 7, and referred to Judiciary Committee.

H. 959. Provides for deleting from Section 297f matter referring to federal aid. Introduced February 10, and referred to Public Welfare and Humane Institutions Committee.

H. 960. Authorizes Commissioner to make such direct payments of medical expense as he shall deem necessary. Introduced February 10, and referred to Public Welfare and Humane Institutions Committee.

H. 980. Authorizes Commissioner to make such direct payment of medical expense as he shall deem necessary. Introduced February 10, and referred to Public Welfare and Humane Institutions.

H. 1155. Concerns comprehensive social insurance protection for all Connecticut residents; provides for pooled insurance tax

savings. Introduced February 11, and referred to Insurance Committee.

DELAWARE

Old Age Welfare—S. 89. Makes appropriations to the Old Age Welfare Commission for the expense involved in the settlement work of the Commission. Introduced January 21, and referred to Finance Committee. Passed Senate March 7.

S. 40. Relates to the State Old Age Welfare Commission; increases the maximum amount of assistance. Introduced January 10; referred to Public Health Committee. Passed Senate February 19. Passed House March 19. Approved March 25.

S. 232. Makes a deficiency appropriation to the State Old Age Welfare Commission for the maintenance and operation of the State Welfare Home. Introduced February 26, and referred to Finance Committee.

GEORGIA

H. 279. Establishes a retirement system for aged and incapacitated employees of the Department of Public Welfare, the Department of Public Health, the Department of Labor, and employees of County, city-county and city Boards of Health and other State employees, and for other purposes. Introduced February 18, and referred to State of Republic Committee.

IDAHO

Old Age Pension—H. 92. Amends Section 10 of Chapter 181 of Session Laws 1945, relating to allotment not being decreased where two or more recipients live together. Introduced January 27.

Old Age Assistance—S. 18. Fixes $50 per month as minimum old age assistance payment to individuals and $90 for married couples. Introduced January 15.

ILLINOIS

Old Age Assistance—H. 32. Increases from $100 to $200 the burial maximum for aged persons in the Old Age Assistance Act. Introduced January 28, and referred to Public Aid Committee.

H. 63. Fixes $50 a month as the maximum old age assistance payment. Introduced February 4, and referred to Public Aid Committee.

H. 64. Provides old age pension payments, made to recipients whose children are able to support them, but who "fraudulently do not" provide such support, shall be recoverable. Introduced February 4, and referred to Public Aid Committee.

H. 72. Amends old age pension act to provide that physical or mental incapables 60 years old may obtain the benefits. Introduced February 18, and referred to Personnel Committee.

INDIANA

Support of Parents—H. 79. Authorizes circuit and superior courts to order persons to support their parents, courts to specify amount of support. Failure to carry out court order is punishable as contempt of court. Introduced January 21, and referred to Social Security Committee. Passed Senate February 27. Approved March 6. Chapter no. 82.

Townsend Old Age Plan—SCR. 4. Memorializes Congress to pass the pending Townsend Old Age Pension Plan bill. Introduced January 24; referred to Federal Relations Committee.

Old Age Assistance—S. 19. Increases old age assistance maximum benefits from $40 to $60 a month.

H. 109. Creates a lien for all old age assistance after May 1, 1947, with notice to all persons now assisted offering choice of withdrawing, or continuing to receive under lien provisions. Provides for recovery without interest from estate of deceased recipient and for holding claim in abeyance if estate is occupied by spouse. Introduced January 22, and referred to Social Security Committee. Passed House February 12. Passed Senate February 25. Approved March 12. Chapter no. 144.

IOWA

Old Age Assistance—S. 86. Sets a January 1, 1948, limitation on lien of old age assistance benefit lien on property. Introduced January 23; referred to Social Security Committee.

S. 225. Repeals old per capita tax to support old age assistance law. Introduced February 7, and referred to Ways and Means Committee.

H. 136. Taxes suspended to old age recipients are to be paid from old age assistance fund. Introduced January 28, and referred to Old Age Assistance Committee. Passed House February 3. Reported favorably in Senate February 18.

H. 252. Abolishes outdated per capita tax for old age assistance funds. Introduced February 12, and referred to Old Age Committee.

H. 409. Provides for license and inspection of nursing and boarding homes for aged. Introduced February 26, and referred to Public Health Committee.

KANSAS

Old Age Assistance—S. 44. Provides that combined income or resources of both husband and wife shall be considered in determining eligibility of either for assistance. Introduced January 27, and referred to Public Welfare Committee. Passed Senate March 5. Reported favorably in House March 7.

H. 43. Provides any applicant be considered in need if resources are less than $50 per month or joint resources of man and wife less than $90 per month. Introduced January 28, and referred to Public Welfare Committee. Reported unfavorably in House February 28.

MARYLAND

Old Age Assistance—H. 49. Amends Sections 2, 3, 4, 16, 17, 19, and 21 of Article 70A, clarifying the provisions of said sections, increasing the payments which may be awarded and providing for the abolition of certain requirements in the event of certain future Federal legislation. Introduced January 3, and referred to Ways and Means Committee.

MASSACHUSETTS

Annual Pension—S. 183. Provides for establishment of an annual pension of $600 for all citizens over 60 years of age. Introduced January 10, and referred to Pensions Committee.

Old Age Assistance—S. 19. Authorizes the granting of old age assistance to certain deserving aliens. Introduced January 1, and referred to Pensions Committee.

S. 21. Reduces the age at which persons shall be eligible to receive old age assistance to 60 years. Introduced January 1, and referred to Pensions and Old Age Assistance Committee.

S. 22. Further regulates grants to recipients of old age assistance. Introduced January 1, and referred to Pensions and Old Age Assistance Committee. Referred to 1948 Session February 26.

S. 105. Reduces the age at which persons shall be eligible to receive old age assistance to 60 years, and increases the amount of payment of old age assistance. Introduced January 8, and referred to Pensions Committee.

S. 134. Further regulates the granting of old age assistance, so-called. Introduced January 9, and referred to Pensions and Old Age Assistance. Referred to next annual session February 5.

S. 138. Provides for the levying of an annual tax on citizens of the Commonwealth to provide additional revenue for carrying out the provisions of the old age assistance law. Introduced January 8, and referred to Taxation Committee.

S. 181. Provides for reimbursement to recipients of old age assistance for expenses in convalescent homes in certain cases. Introduced January 10, and referred to Pensions Committee. Withdrawn in Senate February 17. Withdrawn in House February 20.

S. 247. Further regulates state reimbursement to cities and towns on account of old

age assistance. Introduced January 10, by Massachusetts Society for Old Age Pensions, and referred to Pensions Committee. Withdrawn in Senate February 17. Withdrawn in House February 20.

S. 248. Repeals the old age assistance law and substitutes and old age pension law in conformity with federal requirements. Introduced January 10 by Massachusetts Society for Old Age Pensions, and referred to Pensions Committee. Withdrawn in Senate February 17. Withdrawn in House February 25.

S. 378. Provides necessary medical care, attention, and expenses for recipients of old age assistance while confined to a hospital. Introduced January 15, and referred to Pensions and Old Age Assistance Committee. Withdrawn in Senate February 17. Withdrawn in House February 24.

S. 380. Provides for the reduction of the eligibility age under the old age assistance law and for a minimum weekly payment. Introduced January 15, and referred to Pensions and Old Age Assistance Committee. Referred to 1948 Session February 20.

H. 166. Relates to the granting of old age assistance. Introduced January 1, and referred to Pensions Committee. Referred to 1948 Session February 20.

H. 167. Extends the benefits of the old age assistance law to certain persons not citizens of the United States. Introduced January 1, and referred to Pensions Committee.

H. 438. Abolishes the old age assistance fund and provides that all payments and reimbursements by the Commonwealth to cities and towns under the old age assistance law shall be paid from the general fund. Introduced January 8, and referred to Pensions Committee.

H. 535. Relates to the furnishing of adequate assistance to certain aged citizens of the Commonwealth. Introduced January 8, and referred to Pensions and Old Age Assistance.

H. 539. Relates to adequate assistance to certain aged citizens. Introduced January 8, and referred to Pensions and Old Age Assistance.

H. 686. Provides for increases in the state standard budget for old age assistance. Introduced January 9, and referred to Pensions Committee. Referred to 1948 Session February 26.

H. 696. Establishes minimum amounts to be paid under the old age assistance law. Introduced January 9, and referred to Pensions Committee. Referred to 1948 Session February 25.

H. 697. Reduces age requirements of applicants for old age assistance. Introduced January 9, and referred to Pensions Committee. Referred to 1948 Session February 20.

H. 702. Increases the amount of payments under the old age assistance law. Introduced January 9, and referred to Pensions Committee. Referred to 1948 Session February 26.

H. 746. Changes the rate of tax on certain alcoholic beverages (proceeds go to old age assistance fund). Introduced January 9; referred to Taxation Committee.

H. 918. Reduces from 65 to 60 years the eligibility age of female applicants for old age assistance. Introduced January 13, and referred to Pensions Committee. Referred to 1948 Session February 20.

H. 920. Directs repeal of the existing old age assistance budget and substitutes the prior old age assistance budget. Introduced January 13 by Massachusetts Society for Old Age Pensions, and referred to Pensions Committee.

H. 925. Increases minimum payments under the Old Age Assistance Act. Introduced January 13 by Massachusetts Society for Old Age Pensions, and referred to Pensions Committee. Referred to 1948 Session February 26.

H. 933. Sets up a subdivision of appeals by persons aggrieved by failure to render assistance under the Old Age Assistance Law. Introduced January 13 by Massachusetts Society for Old Age Pensions, and referred to Pensions Committee.

H. 936. Relates to eligibility for old age assistance. Introduced January 13, and referred to Pensions Committee. Referred to 1948 Session February 20.

H. 937. Reduces from 65 to 60 years the eligibility age of applicants for old age assistance. Introduced January 13, and referred to Pensions Committee. Referred to 1948 Session February 20.

H. 938. Relates to ownership of real estate by persons applying for old age assistance and places a lien upon the estate of a deceased person who has received such assistance. Introduced January 13, and referred to Pensions Committee.

H. 1013. Provides for the establishment of a State lottery, the net proceeds of which shall be credited to the old age assistance fund. Introduced January 13 by Massachusetts Society for Old Age Pensions, and referred to Ways and Means Committee.

H. 1185. Makes provisions of the old age assistance law applicable to certain totally disabled persons. Introduced January 14, and referred to Pensions and Old Age Assistance Committee. Referred to 1948 Session February 20.

H. 1193. Reduces the age requirements of applicants for old age assistance. Introduced January 14, and referred to Pensions and Old Age Assistance Committee. Referred to 1948 Session February 20.

H.B. 1246. Levies a $2 tax on all citizens of the Commonwealth to provide additional revenue for administering the old age assistance law. Introduced January 14, and referred to Taxation Committee.

H. 1262. Provides for the imposition of a 4¢ tax per gallon on gasoline used for aviation; relates to using the proceeds thereof for financing the cost of old age assistance. Introduced January 15, and referred to Aeronautics Committee.

H. 1404. Provides for the repeal of certain provisions of the old age assistance law relating to contributions by children to the support of their parents. Introduced January 15, and referred to Pensions and Old Age Assistance Committee.

H. 1405. Provides that needy persons be made eligible for old age assistance, so-called, upon reaching the age of 60. Introduced January 15, and referred to Pensions and Old Age Assistance Committee. Referred to 1948 Session February 20.

H. 1406. Extends the benefits of the old age assistance law, so-called, to certain persons not citizens of the United States. Introduced January 15, and referred to Pensions and Old Age Assistance Committee.

H. 1408. Provides that the holding of certain insurance policies shall not disqualify applicants from receiving old age assistance. Introduced January 15, and referred to Pensions and Old Age Assistance Committee.

H. 1411. Provides that needy persons be made eligible for old age assistance, so-called, upon reaching the age of 60. Introduced January 15, and referred to Pensions and Old Age Assistance Committee. Referred to 1948 Session February 20.

H. 1506. Extends old age benefits to persons over the age of 60. Introduced January 16; referred to Pensions and Old Age Assistance Committee.

H. 1587. Provides that the benefits of old age assistance be extended to persons over the age of 60 and for increasing the minimum monthly rate of such assistance. Introduced January 16, and referred to Pensions and Old Age Assistance Committee. Referred to 1948 Session February 20.

H. 1589. Defines further "income" as used in the old age assistance law, so-called. Introduced January 16, and referred to Pensions and Old Age Assistance Committee.

MICHIGAN

Old Age Pensions—S. 50. Amends Section 27 of Act 280 of 1939, as amended by Act 225 of 1945, to prevent denial of old age assistance to persons having income of less than $300, if otherwise eligible. Introduced January 22; referred to Public Health and Social Aid Committee.

Old Age Assistance—S. 10. Amends Sections 26 and 28 of Act 280, 1939, as amended by Act 67 of 1945 and Act 225 of 1945, to provide for payment of old age assistance to persons not contractually responsible for an indigent; raises maximum from $40 to

$50; raises maximum for hospitalized cases and persons in convalescent homes from $60 to $75. Introduced January 8, and referred to Public Health and Social Aid Committee.

H. 41. Amends Section 55 of Act 280 of 1939, as amended by Act 85 of 1943, to raise residence requirements from 1 year to 3 years in order to get relief. Introduced January 16, and referred to Social Aid and Welfare Committee.

H. 71. Amends Section 26 of Act 280 of 1931, as amended by Act 67 of 1945, to change residence requirements for old age assistance to those of Section 55 (A-1). Introduced January 23, and referred to Social Aid and Welfare Committee.

MINNESOTA

Old Age Assistance—S. 2. Amends Laws 1943, Chapter 456, Section 1, Subdivision (b) and Minnesota Statutes 1941, Section 256.16, by raising old age assistance to $60 monthly at 60 years of age. Introduced January 8 and referred to Public Welfare Committee.

S. 8. Relates to changing the $40 maximum old age assistance to "reasonable subsistence." Introduced January 13, and referred to Public Welfare Committee.

S. 12. (Same as H. 9) Provides for a minimum of $50 a month. Introduced January 14, and referred to Public Welfare Committee.

S. 13. (Same as H. 8) Repeals Old Age Assistance Law. Introduced January 14, and referred to Public Welfare Committee.

S. 33. Increases old age assistance to $50 until 1948. Introduced January 16, and referred to Public Welfare Committee.

S. 48. (Same as H. 71) Provides which county shall pay the aid to an old age assistance recipient in case of his removal therefrom. Introduced January 20, and referred to Welfare Committee.

S. 103. (Same as H. 34) Increases old age assistance payment to $50. Introduced January 27, and referred to Public Health Committee.

S. 144. Amends Statute 256.18, Subdivision 2, Minnesota Statutes 1945. Introduced January 29; referred to Public Welfare Committee.

S. 182. (Same as S. 33) Increases old age assistance payment to $50 until 1948. Introduced January 30. Reported with amendment in Senate February 5. Passed Senate February 11. Reported with amendment in House March 4.

S. 261 (Same as H. 258) Relates to old age assistance. Introduced February 4; referred to Public Welfare Committee.

S. 262. (Same as H. 374) Increases old age assistance $55 maximum with power to Director of Social Welfare to add an additional $5 to meet the increased cost of living. Introduced February 4; referred to Public Welfare Committee.

H. 8. (Same as S. 13) Introduced January 14, and referred to Public Welfare Committee.

H. 10. (Very similar to S. 13) Provides for a repeal of the lien law. Introduced January 14, and referred to Public Welfare Committee.

H. 9. (Same as S. 12) Introduced January 14, and referred to Public Welfare Committee.

H. 34. Increases old age assistance to $50. Introduced January 16, and referred to Welfare Committee.

H. 35. Increases old age assistance to $60. Introduced January 16, and referred to Welfare Committee.

H. 35. Increases old age assistance to $60. Introduced January 16, and referred to Welfare Committee.

H. 55. (Same as S. 8) Changes the $40 maximum old age assistance to "reasonable subsistence." Introduced January 20, and referred to Public Welfare Committee.

H. 56. Provides for a minimum of $60 and maximum of $80. Introduced January 20, and referred to Welfare Committee.

H. 57. (Same as S. 13) Eliminates lien law clause from the old age assistance law. Introduced January 20, and referred to Welfare Committee. Indefinitely postponed February 20.

H. 71. (Same as S. 48) Introduced January 21, and referred to Welfare Committee.

H. 72. (Same as S. 33) Increases old age assistance to $50 until 1948. Introduced January 21, and referred to Welfare Committee.

H. 166. Prescribes property limitation for recipient's eligibility for old age assistance. Introduced January 27, and referred to Welfare Committee.

H. 258. (Same as S. 261) Introduced January 31, and referred to Welfare Committee.

H. 374. (Same as S. 262) Introduced February 5; referred to Welfare Committee.

MISSOURI

Old Age Pensioners—H. 41. Makes appropriations of $2,000,000 for the payment of certificates of old age pensioners. Introduced January 28, and referred to Appropriations Committee.

Old Age Assistance—S. 130. Repeals Section 9406, Laws of Missouri, 1943, pages 950 and 951, relating to establishing eligibility of applicants for public assistance; enacts four new sections. The bill provides that Division of Welfare of Department of Public Health and Welfare shall determine eligibility of applicants for public assistance. Introduced February 6, and referred to Public Health Committee.

H. 16. Adds a new section to Chapter 52, providing for the payment of funeral expenses for old age assistance recipients. Introduced January 21, and referred to Appropriations and Transportation Committees.

H. 17. Amends Section 9410 relating to investigation of applicants for old age assistance. Introduced January 21; referred to Social Security Committee.

H. 92. Repeals Section 9406 of S. 23, approved October 15, 1946, relating to the eligibility for public assistance; enacts a new section 9406. Introduced February 5, and referred to Social Security Committee.

H. 95. Repeals Section 9406A of S. 23, approved October 15, 1946, relating to the eligibility for old age assistance; enacts a new section providing $3,500 for single and $4,000 for married, as maximum property owned by a person receiving old age assistance. Introduced February 5, and referred to Social Security Committee.

H. 103. Amends Section 9460A of S. 23, approved October 16, 1946, relating to determination of property values in determining eligibility of persons for old age assistance; provides that value of real property as listed in assessors' book be conclusive upon commission. Introduced February 10; referred to Social Security Committee.

MONTANA

Old Age Assistance—S. 38. Amends Section III of Part III of Chapter 82, Laws of 1937, relating to the amount of assistance to be paid to old age recipients; repeals all acts in conflict therewith. Introduced January 24, and referred to Relief and Social Welfare Committee.

H. 59. (Formerly CCH H. 56) Increases old age pensions. Introduced January 20, and referred to Social Security Committee. Reported unfavorably in House January 30. Killed in House January 30.

H. 71. Amends Section XI of Part III of Chapter 178, Laws of 1943, relating to the amount of property exempt from claim and to recovery from the estate of a decedent and to claim for old age assistance, and that no claim shall be enforced against real estate in certain cases; provides method for distribution of funds so recovered. Introduced January 21, and referred to Social Security Committee. Amended in House January 29. Passed House January 30. Passed Senate February 8. Approved February 15. Chapter no. 63.

H. 87. Amends Section V of Part III of Chapter 82 of the Session Laws of 1937, relating to the amount of reimbursements by county departments of public welfare to the State Department of Public Welfare for old age assistance grants. Introduced January 22, and referred to Social Security Committee. Reported unfavorably in House January 30. Killed in House January 30.

C.C.H. H. 91. Amends Section XI of Part III of Chapter 178 of the Laws of 1943, relating to the amount of property exempt from claim and to recovery from the estate of a decedent and to claim for old age assistance; no claims shall be enforced against real estate in certain cases; provides method for distribution of funds so recovered. Introduced January 20.

Old Age Pensions—C.C.H. H. 56. Increases old age pensions. Introduced January 15.

Public Assistance—H. 69. Amends Section V of Part III and Section X of Chapter 82 of the Session Laws of 1937, relating to the amounts of reimbursements by county departments of public welfare for grants for old age assistance and grants to aid needy blind to the State Department of Public Welfare. Introduced January 21, and referred to Social Security Committee. Passed House February 4. Reported with amendment in Senate February 8. Passed Senate February 10. Approved February 18. Chapter no. 69.

Aged, Home for—C.C.H. H. 77. Appropriates $650,000 out of the moneys received from the sale of the bonds as provided for in referendum no. 50 passed by the qualified voters of Montana at the general election held November 5, 1946 for the purpose of selection of a tract of land on which to erect suitable buildings to be used as a home for the aged. Introduced January 20.

H. 194. Sets aside and defers the sale of $650,000 worth of the bonds as provided in Referendum no. 50, passed by the qualified voters of the State of Montana at the General Election of 1946, for the purpose of erecting suitable buildings to be used as a home for aged men and women. Introduced January 31, and referred to Appropriations Committee. Amended and passed in House February 21. Reported unfavorably in Senate March 1. Killed in Senate March 3.

NEBRASKA

Old Age Assistance—Bill no. 83. Amends Revised Statutes Supplement, 1945, to provide that an applicant for old age assistance must have been a resident of Nebraska one year immediately preceding the date of application for assistance. Introduced January 14. Indefinitely postponed February 13.

Bill no 318. Amends Section 68-230, 1945 Supplement; provides that the amount of the annual per capita tax imposed for the purpose of the State Assistance Fund shall be $3 annually. Introduced January 31, and referred to Revenue Committee.

Bill no. 467. Amends Section 68-230, Revised Statutes Supplement, 1945, relating to old age assistance; provides that the amount of the annual per capita tax imposed for the purpose of the State Assistance Fund shall be $3 annually. Introduced February 3, and referred to Revenue Committee.

NEW HAMPSHIRE

Old Age Assistance—H. 25. Relates to qualifications for old age assistance. Introduced January 14, and referred to Judiciary Committee.

H. 141. Relates to federal reimbursement from decedent's estate for old age assistance. Introduced January 28, and referred to Judiciary Committee. Passed House February 27. Passed Senate March 13. Approved March 18. Chapter no. 44.

NEW MEXICO

Old Age Pensions—H. 6. Grants $60 a month pensions to persons 65 years of age and older who are without other means of support. Introduced January 20; referred to Public Affairs Committee. Killed in House February 13.

Old Age Assistance—H. 138. Fixes a minimum of $60 for old age assistance. Introduced February 13, and referred to Ways and Means Committee. Killed in House February 26.

H. 156. Legalizes bank nights for theaters for benefit of old age assistance. Introduced February 18, and referred to Ways and Means Committee.

NEW YORK

Hospitalization—A. 1431. Provides old age assistance district or public welfare district which provides temporary care in hospitals for recipient of old age assistance, assistance to blind, or aid to dependent children, shall not charge back cost to another district. Introduced February 7, and referred to Social Welfare Committee. Passed House February 26. Passed Senate March 10.

Old Age Assistance—S. 467. (Same as S. 523) Allows local welfare official to determine whether cost of burial of old age recipient cannot be met from other sources and shall be prior claim against amount received from assets and take precedence over claim for old age assistance granted. Introduced January 21, and referred to Relief and Welfare Committee. Reported by substitute A. 419 in Senate March 17.

C.C.H. S.R. 12. Creates committee to make study and develop a program for the elderly and aging, to include low-cost housing, employment policies, social security, guidance and counselling; provides for a report March 1, 1948, and appropriates $15,000. Introduced January 17, and referred to Finance Committee.

A. 432. Reduces from 65 to 60 years, minimum age for old age assistance. Introduced January 20, and referred to Ways and Means Committee.

A. 433. Provides minimum amount of award for old age assistance and assistance to blind shall not be less than $50 a month, and, if applicant has other income in excess of $20 a month, minimum may be tapered by subtracting therefrom amount of other income. Introduced January 20, and referred to Ways and Means Committee.

A. 523. (Same as S. 467) Allows local welfare official to determine whether cost of burial of old age recipient cannot be met from other sources and shall be prior claim against amount received from assets and take precedence over claim for old age assistance granted. Introduced January 21, and referred to Social Welfare Committee.

A. 1415. Provides person eligible for old age assistance shall receive $50 a month instead of present allowances. Introduced February 7, and referred to Ways and Means Committee.

NORTH CAROLINA

Old Age Assistance—S. 21. Amends certain sections of Chapter 108 of the General Statutes relative to old age assistance and aid to dependent children so as to provide for full conformity with the provisions of the Social Security Act. Introduced January 14, and referred to Public Welfare Committee. Passed Senate February 3. Passed House February 17. Ratified February 19.

NORTH DAKOTA

Old Age Assistance—H. 16. Amends Sections 50-0734, Revised Code of 1943, pertaining to recovery from the estate of recipient of assistance. Introduced January 7 by Legislative Research Committee. Passed Senate February 20. Approved March 4.

OHIO

Old Age Assistance—S. 94. Raises old age pension maximum to $60 a month; now $50. Introduced February 10.

S. 95. Permits old age pensioner to earn not to exceed $120 per year in salary or wages without deduction from pension. Introduced February 10.

S. 135. Eliminates the maximum of $50 monthly and $600 annually in the amounts payable under the "aid-for-the-aged" law. Introduced February 11, and referred to Judiciary Committee.

H. 62. Reduces the eligibility of recipients for aid to aged from 65 to 60 years. Introduced January 22.

H. 166. Exempts for three years, or during the present emergency, the first

$600 residential property rental received by a property owner, from income in determining his eligibility for aid under the old age pension. Introduced February 4.

Old Age Pensions—H. 6. Increases burial allowance to old age pensions from $140 to $150. Introduced January 21.

H. 44. Exempts homes of old age pensioners ($3,000 if single and $4,000 if married) from recovery of aid furnished, and increases burial allowance from $140 to $200. Introduced January 21.

OKLAHOMA

Old Age Assistance—S. 91. Authorizes transfer of certain people to the old age assistance program. Introduced February 5, and referred to Public Welfare Committee. Passed Senate March 10. Reported with amendment in House March 18.

H. 6. Relates to earnings of old age assistance recipients. Introduced January 8. Passed House February 11.

H. 58. Provides for a minimum old age assistance payment of $50 a month. Introduced January 27, and referred to Social Security Committee. Passed House February 5.

OREGON

Old Age Assistance—S. 111. Provides relief for needy citizens 65 years of age and over. Introduced January 27, and referred to Ways and Means Committee. Reported unfavorably in Senate February 27. Indefinitely postponed in Senate February 27.

H. 195. Relates to old age assistance. Introduced February 3, and referred to Social Welfare Committee. Amended in House March 14. Passed House March 14.

PENNSYLVANIA

Old Age Assistance—H. 281. Further Amends Clause (b) of Section 9 of the Public Assistance Law of 1937, P.L. 2051, by reducing from 70 to 60 the age at which old age assistance shall be paid. Introduced February 10, and referred to Welfare Committee.

SOUTH DAKOTA

Old Age Assistance—S. 38. Amends South Dakota Code 55,3619, as last amended by Chapter 301, Session Laws of 1945, relating to old age assistance fund. Introduced January 21, and referred to State Affairs Committee. Passed Senate February 1. Passed House February 25. Approved February 28.

H. 102. Repeals old age assistance lien. Introduced January 30; referred to Social Welfare Committee.

TENNESSEE

Old Age Pensions—S. 115. (Same as H. 169) Provides for pension for persons 90 years of age and over. Introduced January 21. Passed Senate February 27. Passed House March 6.

S. 379. (Same as H. 492) Amends old age pension law, relating to counties' share of payments. Introduced February 6; referred to Social Welfare Committee. Passed Senate February 14. Passed House February 18. Approved February 21.

H. 169. (Same as S. 115). Introduced January 20.

H. 492. (Same as S. 379) Introduced February 6; referred to Finance, Ways and Means Committee.

H. 534. Increases minimum old age pensions. Introduced February 7; referred to Pensions Committee.

TEXAS

Old Age Assistance—H. 28. Provides old age assistance to every person meeting the qualifications of this Act not to exceed $45 per month. Introduced February 3, and referred to State Affairs Committee.

H. 45. Amends Sections 20, 21, 22, 23, and 24 of Article 695c, Revised Civil Statutes of Texas Old Age Assistance Act; confers jurisdiction upon the Commissioners' Courts of the State of Texas to pass upon the applications. Introduced February 3, and referred to State Affairs Committee.

H. 78. Provides that the Department of Public Welfare shall not consider income

derived from any source by the needy recipients of old age assistance, where the total amount for any calendar year does not exceed $250. Introduced February 3, and referred to State Affairs Committee.

H. 239. Fixes a lien on property of persons receiving old age assistance from the state. Introduced February 3, and referred to State Affairs Committee.

H.J.R. 21. Proposes a constitutional amendment increasing old age assistance. Introduced February 10, and referred to Constitutional Amendments Committee.

Confederate Veterans—H. 264. Amends Section 1, Chapter 283, Acts of 1945, to provide for the payment of increased pensions to the widows of Confederate veterans. Introduced February 4; referred to State Affairs Committee.

UTAH

Old Age Relief—S. 83. Relates to old age relief. Introduced January 22, and referred to Welfare Committee.

VERMONT

Old Age Assistance—H. 3. Eliminates citizenship qualification for old age assistance and increases benefit for married couples. Introduced January 17, and referred to Social Security Committee. Amended in House January 31. Passed House February 4. Amended and passed in Senate March 9. House concerned with Senate amendment March 13.

WASHINGTON

Old Age Pensions—H. 1. Relates to the eligibility for, and the payment of, old age pensions; amends Section 4, Chapter 1, Laws of 1941, as last amended by Section 2, Chapter 7, Laws of 1945, and Section 5, Chapter 1, Laws of 1941, as last amended by Section 3, Chapter 7, Laws of 1945 (Sections 9998-37 and 9998-38, Remington Revised Statutes). Introduced January 15, and referred to Social Security Committee.

Social Security Act—SJM. 2. Memorializes Congress to extend the benefits of the Federal Social Security Act to include all federal, state, county, municipal and district governments, and persons employed in maritime, agriculture, and domestic pursuits. Introduced January 28, and referred to Labor Committee. Passed Senate March 4.

WEST VIRGINIA

Old Age Assistance—S. 125 Relates to amount and exemptions of liens against property for public assistance received. Introduced January 29, and referred to Judiciary Committee.

S. 126. Relates to limitation of amount of grants to aged persons. Introduced January 29, and referred to Judiciary Committee.

S. 127. Relates to eligibility of aged persons for public assistance. Introduced January 2, and referred to Judiciary Committee.

S. 153. Relates to the enforcement of relatives' liability with relation to aged persons, blind persons, or dependent children. Introduced January 30, and referred to Judiciary Committee.

WISCONSIN

Old Age Assistance—S. 112. Amends 49.23 (1) of the Statutes, relating to eligibility for old age assistance. Introduced February 5, and referred to Education and Public Welfare Committee.

A. 85. Amends 49.23 (1) of the Statutes, relating to old age assistance to inmates of county homes. Introduced January 29, and referred to Public Welfare Committee.

A. 121. Amends 49.25 and 49.26 (5) of the Statutes, relating to old age pension liens. Introduced February 4, and referred to Public Welfare Committee.

WYOMING

Old Age Assistance—HJM. 3. Memorializes Congress to enact legislation relating to old age assistance. Introduced January 27, and referred to Committee no. 3. Passed House February 5. Passed Senate February 13. Approved February 15.

GERONTOLOGIC reviews

OVARIAN TRANSPLANTATION

There appeared in *Science* last year two articles dealing with the transplantation of ovaries. The report of Whitney (Science, *103*: 654-655, 1946) dealt with the successful transplantation of the ovaries between bitches of different breed, a feat that had not been realized previously. According to the author, the crux of his success was the use of recipients in heat. He was able in two instances to perform bilateral ovarian transfers from old bloodhounds to two relatively young foxhounds in estrus each of which had previously borne one litter. Following the procedure, signs of estrus declined for five days but then recurred and lasted for a normal twenty day cycle. Conception did not occur even though coitus was performed during the latter period.

Significant was the observation that when the animals next entered into heat the elapsed period did not concur with their own cycle but rather conformed to the donor's cycle. Months after the second estrus one of the animals was sacrificed and examination of the implanted ovaries revealed corpora lutea and numerous follicles. The number of follicles greatly exceeded that usually found in the ovaries of an 8 year old dog. From the gross and microscopic examination of the implants and the postoperative behavior of the animals, the author believed that he had successfully accomplished the transplantation of ovaries between dogs of different breed.

Saunders (Science, *104*: 257, 1946) described in a short note the unilateral and bilateral mutual transfer of ovaries between adult albino rats and mice. After a postoperative period of seven weeks the transplanted gonads were examined histologically and it was found that all had persisted and all possessed an adequate blood supply. In several cases of rat's ovary grafted into a mouse there was evidence of regression of the implant; but, on the other hand, in several instances where mouse ovary was transplanted into a rat, the implant appeared cystic as though from overstimulation. The author suggests that in the former instances the relatively large rat ovary was not sufficiently stimulated by the mouse's pituitary; whereas, in the latter instances the recipient rat's pituitary overstimulated the relatively small mouse ovary transplant.

In light of the recently renewed interest in gonadal transplantation one is reminded of the fact that it was in 1849 that the first report appeared concerning the successful transfer of gonads. Following that initial report there began a wide series of experiments in many quarters with subsequent writings. The latter comprise one of the most interesting chapters in the field of experimental biology. That the problem is not settled, particularly with regard to interbreed and heteroplastic grafts, is evidenced by the previously cited papers; and during the first half of the present decade, experimental geneticists have devised ingenious procedures and applications of gonadal transplantation. One procedure in particular promises to open up new ave-

nues of approach in many related fields of experimental biology, and will be presented at some length in the concluding portion of this article after first briefly reviewing the interesting early history of the subject of the grafting of gonads.

Almost a century has passed since Berthold (Archiv für Anatomie, Physiologie, und wissenshaftliche Medicin, *16:* 42–46, 1849), first reported the successful mutual transfer of testicles between two cocks after castrating both animals. After five months the gonads were found to be full of active spermatazoa and the animals possessed normal sexual instincts. Within approximately the next sixty years many investigators tried to either confirm or refute Berthold's findings. Among the multitude of workers we find such names as Mantigazza, Heritzka, Ribbert, Fóa, Maximow, Guthrie, and Castle. Unfortunately most of the results of the workers were negative in character because testicular tissue is so delicate that it is most prone to injury and as such was not suited to experimentation in the field of grafting.

Fortunately, however, there remained the female gonad with which experimental zoologists might satisfy their curiosity as to whether reproductive glands could be successfully grafted from one animal to another with preservation of their function in the new host. During the last decade of the ninteenth century interested individuals began to devote their attention to the matter. Pathologists, physiologists, biologists, experimental and clinical surgeons, and geneticists attacked the problem almost simultaneously and often reached diametrically opposite results.

As the logical point of assault, the autoplastic graft was attempted and successfully first performed by Knauer (Centralblatt für Gynäkologie, Leipzig, *20*: 524-528, 1896). A surgeon, Chrobak, who unsuccessfully attempted to control menopausal symptoms in surgically castrated women by feeding ovarian substance, led Knauer to undertake the experiments with rabbits that resulted in ultimately successful autogenous ovarian grafts. In quick succession confirmatory reports followed, and associated with these reports we find the names of Ribbert, Grigorieff, Basso, Stilling, Halban, and others.

Knauer (Centralblatt für Gynäkologie, Leipzig, *22*: 201-203, 1898) also was first to report seemingly positive results with homoplastic ovarian transplants using rabbits as the experimental animals. He achieved success in two out of thirteen attempts. Because of the more difficult nature of a homoplastic transplant, Knauer's work could only be confirmed by a moderate percentage of the investigators who attempted to repeat the experiment in rabbits or other animals.

After having accepted the feasibility of homoplastic transplants, attention was next directed to obtaining functional gonads as evidenced by resulting offspring from the implanted ovaries. Much of the early work done in this phase of endeavor was inconclusive or completely negative. The experiments of Guthrie (Journal Experimental Zoölogy, *5:* 563–576, 1907–08) and Magnus (Norsk magasin for laegevidenskapen, 5r, 68A., *5*: 1057-1071, 1907), although important landmarks, were lacking of critical quality. Castle and Phillips (Science, N.S., *30*: 312-314, 1909), (Carnegie Institution of Washington, Publication no. 144, 1911) and (Science, N.S., *38*: 783-786, 1913), however, obtained irrefutable positive results in a small percentage of the guinea pigs with which they worked. There only remained the problem of increasing the percentage of functional homoplastic ovarian grafts in order that this technique might become a valuable tool for experimental biologists. Robertson (Proceedings of Society for Experimental Biology and Medicine, *44*: 302, 1940), and (Journal Experimental Zoölogy, *89*: 197-232, 1942) turned his efforts to the devising of a more satisfactory hompolastic grafting technique in connection with some proposed genetic experiments dealing with lethal genes in mice.

Further refinement of the Robertson

technique was proposed by Russell and Hurst (Proceedings of the National Academy of Sciences, *31*: 267-273, 1945) and they obtained functional homoplastic ovarian transplants in forty out of one hundred operations using the modified procedure. They were able to produce pure strain mice from hybrid mothers following ovarian transplantation employing their more feasible modification. Later in the same year Russell and Douglass (Proceedings of the National Academy of Sciences, *31*: 402-404, 1945) reported the development of an ingenious variation on the theme of homoplastic ovarian transplants.

They transplanted embryo mouse ovaries to adult mice. The donor ovaries were obtained from embryos aged 13½ to 14½ days and they were implanted into the ovarian capsules of young adults whose ovaries had been removed immediately before. A few days after operation a male animal was placed with each host for mating purposes. Of eight such operations three were successful in that the implanted ovaries functioned to produce offspring that could be readily distinguished by the application of genetics and marker genes.

Suggested applications for the unique device have been summarized by the authors as follows. "This introduces a method that could be used for the genetic identification of some lethals and certain types of embryos that have to be killed for examination. It should prove of value in studies on differences in maternal environments, in experiments on the relation of hormonal and other factors to the development and functioning of the ovary and possibly for investigations on the origin of the germ cells. An extension of the method over successive generations, to produce animals descended from any number of unborn direct female ancestors, would provide still further possibilities for research." There seems to be but little doubt that employment of the procedure as suggested above could result in worthwhile additions to the science of gerontology.

RALPH B. WOOLF

PROLONGATION OF LIFE BY STARVATION

Recent experiments on the effect of restricted caloric intake on longevity of rats (Riesen, Herbot, Walliker, and Elvehjem, American Journal of Physiology, *148*: 614, 1947) confirm the observation of many investigators that the life span of various invertebrates and mammals can be appreciably increased by starvation. The condensed graphic data furnished by these authors show a clear trend toward greater longevity on the part of rats fed a restricted caloric diet. However, much of the difference in longevity between the control and experimental animals is due to a greater number of early deaths in the controls.

Carlson and Hoelzel (Journal of Nutrition, *31*: 363, 1946) in a more detailed report describe an increase in the life span of rats intermittently fasted. Fasting one day in four, three, and two days were compared. Control male rats lived an average of 612 days; male rats fasted one day in four averaged 658 days, one day in three averaged 653, and one day in two averaged 683 days. The combined data of the three experimental groups with a total of 46 animals give an average of 664 days. Comparable results were obtained from a series of female rats. Controls averaged 688 days; females fasted one day in four, three, and two days averaged 675, 781, and 733 days respectively. The combined average representing 58 female rats was 730 days.

Similar data were obtained by Robertson, Marston, and Walters (Australian Journal Experimental Biology and Medicine, *12*: 33, 1934) in their intermittent starvation experiments on the white mouse. Failure to use litter-mate controls introduced sizeable variations in the results.

A comprehensive program of study of the role of nutrition in longevity has emanated from the Animal Nutrition Laboratory of Cornell University. McCay, Crowell, and Maynard (Journal of Nutrition, *10*: 63, 1935), McCay, Ellis, Barnes, Smith, and Sperling (Journal of Nutrition, *18*: 15, 1939), McCay, Maynard, Sperling, and Barnes (Journal of Nutrition, *18*: 1, 1939), Will and McCay (Archives of Biochemistry, *2*: 469, 1943) have presented substantial evidence to establish the view that life span is increased by starvation.

The effect of retarded growth upon life span and ultimate body size was analysed in the initial 1935 report. Three groups of rats were used in the experiments; group 1 was fed ad libitum, groups 2 and 3 were fed a diet containing an excess of all essentials but lacking sufficient calories to support growth. Group 2 was placed on this limiting diet two weeks after weaning. These rats were maintained on the limited diet until 766 and 911 days of age during which time growth was suppressed. Restoration of a growth promoting diet induced growth even at these late dates but full body size was not reached. The mean ages of starved males had significantly greater mean ages than the "rapid growth" rats. A particularly interesting point was that some experimental rats lived as much as 200 days longer than the longest lived controls.

The preceding basic observations were confirmed and elaborated in the experiments reported in 1939. Data on calcification of various organs was furnished, and some evidence was obtained indicating that tumor incidence in retarded animals was lower than in the controls. In a third allied series of investigations published in 1943, further confirmation of the initial observations was made and elaborated upon. The effect of various supplements to the diet such as meat, milk, starch, and sugar was studied with no significant differences in the results. Resumption of growth of retarded rats could be effected at a variety of ages, but none of these rats attained the normal body size of control animals.

Of particular interest in the general problem of nutrition in longevity is the fact that a number of investigators have found that the duration of life of invertebrates is also increased by starvation. As early as 1903, Kellog and Bell (Science, *18*: 741, 1903) investigated the effects of limitation of food supply on the size, fertility, activity, and mortality of a silk worm, Bombyx mori. An apparent increased longevity through starvation was described.

Northrup (Journal of Biological Chemistry, *32*: 123, 1917) reported experiments on the effect of prolongation of the period of growth on the total duration of life of Drosophila. Sterile eggs raised from the time of hatching on an adequate yeast-glucose-agar diet had an average length of life of 19.3 days at 27.5 C. When the addition of yeast was delayed until the eighth day of the larval period, the average duration of life was 25.5 days and when yeast addition was delayed until the tenth day, the total duration of life was 28.9 days. However, the increased longevity in both instances was due to a prolongation of the period of growth; length of the adult period was unaltered.

Kopec (British Journal of Experimental Biology, *5*: 204, 1928) concluded, on the basis of experiments on caterpillars of Lymantria dispar L., tadpoles and Drosophila, that prolongation of the total duration of life by continuous or intermittent starvation is effected, not by an increase in the period of adult life, but by an extension of the growth period. Actually, in the Drosophila experiments, the period of adult life was decreased by intermittent starvation.

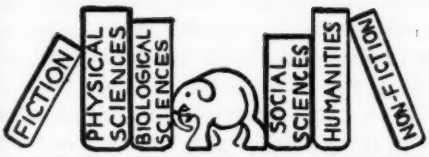
Ingle (Science, *78*: 511, 1933) induced starvation in Cladocerans by the simple expedient of diluting the infusion medium with pond water. An initial series composed of 46 normal and 40 retarded animals indicated an 11.8 per cent increase in longevity in the latter group. A second and larger series again showed greater

longevity for starved animals which lived 68.4 per cent longer than the controls. Similar results were obtained in a third series employing a shorter lived species.

In apparent support of Kopec's conclusion, Ingle stated that "Mothers in diluted medium do not reach sexual maturity as soon . . . as those in undiluted medium." A later and more extensive investigation on Daphnia by Ingle, Wood, and Banta (Journal of Experimental Zoölogy, *76*: 325, 1937) concluded that while semi-starvation during the entire life span increased total duration of life, even more striking results were obtained by shorter periods of starvation.

In summarizing the general status of experimentation on the effects of starvation on longevity, it is pleasant to note that the unusual situation exists wherein a heterogenous group of investigators agree almost completely. All of the foregoing studies confirm the general view that the life span of various animals, invertebrate and vertebrate, is increased by quantitative limitation of the diet. However, there seem to be two divergent approaches to this problem. Apparently, the majority of the workers are seeking to attribute the effect of starvation to a retardation of metabolic rate. The starvation effect would therefore be analagous to the effect of temperature on longevity. Low temperature increases, but high temperature decreases longevity (Loeb and Northrup, Journal of Biological Chemistry, *32*: 103, 1917). A few, notably Kopec, stress the point that longevity after cessation of growth is not altered by starvation and that extension of the period of growth accounts for the apparent increase in total longevity. Kopec's hypothesis is worthy of serious consideration, particularly since it alters the basic approach to the problem. One must seek to determine how prolongation of the growth period wards off crystallization of the aging pattern.

ALBERT I. LANSING



BOOKS

CREATIVE OLD AGE, Clare de Gruchy, Old Age Counselling Center, San Francisco, 1946, $2.75, 143 pages.

This timely and thought-provoking compilation of case histories neatly accents the value of increasing the productive period of the oldster. Time and time again we have all seen, and Clare de Gruchy's case histories forcefully verify, that mental and physical deterioration in the aged individual rapidly follow a cessation of responsibility and productivity, a realization of being unwanted and not needed. Clare de Gruchy's volume demonstrates quite clearly that extension of the "employable" period and reestablishment of a sense of usefulness even in a most limited fashion contribute to a prolongation of the mental and physical well-being in the aging individual. In this respect the recent war was highly effective in restoring to activity many "unemployables." The complex aftermath of the war confronted numerous young folks with trying social, economic, and housing problems. In many instances aging parents and aged grandparents have been able to step in to "fill the breach." In doing so they have been revitalized with a healthy satisfaction of once again being depended upon.

This little volume, which summarizes the efforts of the Old Age Counselling Center in San Francisco, should certainly be read by social workers and students of geriatrics.

ALBERT I. LANSING

AGING SUCCESSFULLY, George Lawton, Columbia University Press, New York, 1946, $2.75, 266 pages.

This book was written as a handbook or daily reference guide for the person who, seeing himself growing older, seeks to exploit the advantages of aging man and to minimize its drawbacks in his own living. Throughout the book emphasis is placed on the advantages of aging. Some of these advantages are: increased experience, insight, perspective, and wisdom, and diminished pressure for economic accomplishments.

The limitations in health, performance, and capacities so often encountered in old age are minimized. The essential characteristics of mental health do not change with age, but Dr. Lawton gives specific details which should prove helpful to elderly people. The author points out that the cantankerous, ill-natured old man is usually the self-centered, ill-adjusted young adult who has grown old. The essence of aging successfully is for the individual to keep mentally active. In order to do this in later maturity, the individual must begin in middle age to make specific plans to be carried out in later life. "In time of youth prepare for age."

The early chapters of the book are devoted to a discussion of the mental and psychologic changes with age which are of importance in personal relations. The author regards increased rigidity of thinking as one of the chief hazards of old age and offers specific methods of combating it. The latter part of the book lists and discusses in detail potential hazards to happiness in older people and suggests methods of avoiding them. The book is anecdotal in nature; the author has drawn illustrative material freely from his wide clinical experience in counselling older people. Ten hints on aging successfully are offered as the book closes. These include: admit to yourself that you are growing older, but remember the advantages of aging as well as the disadvan-

tages; keep mentally active by setting intellectual challenges for yourself each day; avoid self pity; realize that later maturity is most valued for the knowledge of strategy, not for strength or speed; continue to make new friends and acquire new interests.

As a guide to mental hygiene in later life, the book should prove of value to the lay reader.

N. W. SHOCK

THE SECOND FORTY YEARS, Edward J. Stieglitz, J. B. Lippincott Co., Philadelphia and New York, 1946, $2.95, 317 pages.

Medical Science has already provided increased longevity for a large share of our population. Society must now turn its attention toward providing opportunities for continued usefulness of the elderly individual. Not only does society have responsibilities to the elderly individual, but the latter has the responsibility to society of utilizing present knowledge of science and medicine to preserve his own vigor and usefulness. Since the primary liability of aging is depreciation in health, health maintenance becomes increasingly important as individuals age. Furthermore, health is not a right but is an achievement that requires effort on the part of the individual. *The Second Forty Years* makes available to laymen some of this medical and biologic knowledge, which will delay the time of onset and decrease the severity of the impairments of aging. It is in essence a guide book to wiser ways of living.

In discussing the biology of senescence, the author emphasizes the concepts that aging is not a property of individual cells but is a property of the cellular environment and that one of the chief characteristics of aging is the loss of homeostatic capacities for the maintenance of the consistency of this environment. A young child begins life with exceptional reserve capacities with respect to various organ functions, but the accumulated insult of diseases and trauma gradually reduce these reserves with passing years. "What we are today depends on what happened to us yesterday."

The author stresses the importance of educating elderly patients to live with their disabilities. Various chapters in the book are devoted to the techniques of living with a handicapped heart or with high blood pressure. The chapter on high blood pressure presents technical material which may be beyond the comprehension of the lay reader, but in general the author has presented his material in a direct and clear style. The author's description of the genesis of arteriosclerosis presents an attractive hypothesis as established fact. Other chapters deal with nutrition, the climacterium, and the problems of cancer from the point of view of the patient. Throughout the book emphasis is placed on the importance of early diagnosis.

The chapters dealing with the psychologic aspects of aging contain many statements which psychologists will find ambiguous or meaningless. Examples of such statements are as follows: "Exercise of the intellect is mental work" (p. 237); "Accuracy of learning may increase with advancing years" (p. 242); "Social intercourse rarely demands thinking" (p. 246); "It has been estimated by a number of different methods that the *average* mental age is comparable to that of a seven- to eight-year-old child" (p. 253). The author does forcefully present the key to mental health in late maturity as the maintenance of active interests and participation in the social life of the community. He also raises, with good cause, the question of whether it is economically feasible for us to support the increasing army of the aged in complete idleness.

The book is well seasoned with wit and quip. For example, "Glamour has been well defined as that state of affairs in which the package is worth more than the contents" (p. 194). "The breeding of most human be-

ings is the result of purely accidental mattings" (p. 219). Dr. Stieglitz has succeeded in presenting in a readable and forceful manner a great deal of information which, if acted upon, will prove of benefit not only to those in the second forty years, but also to those still in the first forty years.

N. W. SHOCK

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Books received since December 1, 1946, are acknowledged in the following list. Insofar as space and time permit, some will be selected for review in a later issue, but it is unlikely that all will be reviewed.

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Chronic Disease and Psychological Invalidism, by Jurgen Ruesch, American Society for Research in Psychosomatic Problems, New York, 1946, $3.00, 191 pages.

Harvey Cushing, a Biography, by John F. Fulton, Charles C Thomas, Springfield, Illinois, 1946, $5.00, 754 pages.

Human Pathology, sixth edition, by Howard T. Karsner, J. B. Lippincott Co., Philadelphia, 1942, 817 pages.

Modern Management in Clinical Medicine, Chapter 19, "The Care of the Aged," by F. K. Albrecht, Williams & Wilkins, Baltimore, 1946, pp. 1057–1080.

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